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*LONDON, SATURDAY, AUGUST 24, 1839.*

## REVIEWS

*An Historical and Descriptive Account of British America, &c.* By Hugh Murray. 3 vols. Edinburgh, Oliver & Boyd.

We have frequently had occasion to commend the volumes of the 'Edinburgh Cabinet Library.' Of the various works which in these prolific days of book-making have endeavoured to insinuate themselves into public favour in a *mignon* form, and under the winning title of a Cabinet series, we know of none which has held a more even or better regulated course, or which has attained the desired popularity with less sacrifice of sterling merit. The work on British America, now before us, cannot fail to prove one of the most successful portions of the entire series. It displays considerable industry and judgment; combining a great variety of information adapted to the circumstances of the present day, such as every body desires to know; and which is drawn from the best, not unfrequently from original sources. Here we have, first of all, a geographical description of the vast region comprising the British possessions in North America, with its natural history and the discussion of the peculiarities of its climate. Next, the history of its discovery and first settlement, with the series of events which have placed each portion of the whole under the British dominion. Then comes the history of recent political occurrences, and a statement of the various points in dispute between Great Britain and the United States on the one hand, and her colonies on the other. Finally, the subject of emigration is treated at considerable length, and the topographical description of the districts, still open to settlers in our North American possessions, is illustrated by maps, exhibiting their subdivision into townships.

There is but one of these multifarious topics which presents any important difficulties to the author,—we mean, of course, the history of the discontent and recent commotions in Canada. When once on this ground, he may be truly said to tread—

> —— super ignes
> Suppositos cineri doloso.

His sources of information are then all poisoned with the virulence of faction, and he can hardly apply his mind to the study of the litigated questions with such calm patience and temperance as to be quite exempt from the influence, much less from the imputation of the influence, of that party spirit which pervades the atmosphere of the British islands. We confess, it appears to us that the author,—or perhaps we should speak more accurately, though hazarding a conjecture, if we were to say, one of the authors,—of the historical account of British America has not uniformly held himself clear from party bias. In his account of the late troubles, he has chosen Sir Francis Head for his hero. He lauds extremely that baronet's straightforwardness, his no-conciliation system, and his "stern, uncompromising maintenance of monarchical principles." These are phrases well fitted to varnish over a self-willed stickling for despotic authority. But Mr. Murray goes on to say "a war of manifestoes, proclamations, and addresses was forthwith waged between the parties. Perhaps no ruler ever effected more by writing than Sir Francis." No doubt, Sir Francis Head writes and governs in the same dashing style; but nevertheless the sharp-eyed critic can easily discern in the frequent inaccuracy as to matter of fact, the bold but groundless assumptions and vaulting phrases of the writer, the same exorbitant, domineering self-confidence which the citizen feels in the governor. We shall enter no further into this question than to enforce this plain principle, that those who believe that the rights of the people are best confined to a prompt submission to authority, ought to be particularly careful to expel from their writings the language of political brawlers; or if they hold office, they ought to endeavour to set an example of official subordination. In the justness of the following remarks, which we suspect to be from a different hand, we entirely concur:—

"It does not appear that the late disastrous contest can be regarded as arising from grievance on the one side or from oppression on the other. The colonists enjoyed perfect security of person and property; their taxes were exceedingly light; their church enjoyed all its privileges and property; and it is gratifying to add, that religious dissension had no share in the struggle. All the influence of the clergy was exerted against the outbreak, and had, doubtless, much effect in mitigating its violence. The successive governors were men of respectable character, mild manners, and had been popular elsewhere in similar situations. The movement then was not excited by suffering; it was a dispute for power."

Hence, it may be inferred, that since the contest was for power, it must have been brought on by the machinations of a few ambitious individuals. It is not to Canada alone that these remarks are applicable. Though it is usual, by way of palliation, to ascribe every symptom of turbulence to want and distress, yet in reality physical suffering must be carried to an extreme, and last a long time, before it rouses a people into action. It is true that where distress, or in other words where idleness prevails, the people are more easily led on to deeds of violence; yet the exciting cause is not the suffering of the people, but the petty interests of agitators; and perhaps, it must be added, the interest which that very influential party, the press, has in the anxious and alarmed state of the public mind. It is no wonder that theoretical rights of very doubtful value should be contended for with constantly increasing bitterness, at a time when perfect repose and tranquillity would ruin the fourth estate of the realm.

Contemporaneously with the constant bickering between the depositaries of power in Canada, the population and produce of that country,—that is to say, its material prosperity, has advanced most rapidly.

"At the conquest, in 1759, the number of the inhabitants was believed to be 65,000. In 1784 a census, ordered by General Haldimand, gave 113,000. A similar one, taken in 1825, under the authority of the House of Assembly, showed 423,630; another, in 1831, 511,917. There can be no doubt that this last, as well as all the preceding enumerations, was extremely defective. Mr. Chapman, after a careful consideration of all circumstances, considers himself rather under the truth, in fixing the real number at 582,000; and he supposes that by the combined effect of immigration and natural increase, it must have now risen to fully 660,000."

What is stated above has reference solely to Lower Canada. It is supposed that the cultivated lands in that province now amount to at least two millions and a half of acres. Upper Canada had in 1791 a population not exceeding 10,000 souls; these were chiefly settlers from the United States.

"It was not till 1803 that, through the exertions of Colonel Talbot, emigration from Britain was commenced on any large scale. The result of these measures was, that in 1811 the country was found to contain about 9,623 persons paying taxes. By a careful examination in regard to the most populous township, Mr. Gourlay estimated the tax-payers at one-eighth of the entire population, which on this principle must have amounted to about 77,000. A vast addition, however, was given at the close of the last war, in consequence of the low rate of profit and wages and the difficulty of finding employment at home. The attention, first of the labouring, then of the middling class, and finally of the government, was thus forcibly drawn to the relief which might be obtained by removal to a new country, where the means of subsistence were abundant. These motives have attracted a continual succession of emigrants, both individually and in bodies, by whom the population of the province has been most rapidly augmented. In 1824 a series of returns, called for by Parliament, showed the number to be 121,097. In 1828 a similar census produced 185,526. At the end of 1832 the amount had risen to 296,000, and in 1835 to 336,000. It may be observed, too, that these returns are understood to be extremely defective, and the omissions numerous; probably, therefore, the actual population of Upper Canada may not fall materially short of 400,000. Improvement and wealth appear to have kept full pace with the progress of population. We do not find any statement of the number of acres under cultivation till 1828, when they were reported at 570,000. In 1835 they had increased to 1,308,000."

Thus, it appears, that the Canadas have at present a population not falling short of a million; and if to this number be added the inhabitants of Nova Scotia, New Brunswick, Cape Breton, Prince Edward's Island, Newfoundland, and the territories of the Hudson's Bay Company, we shall have not less than a million and a half for the sum total of British subjects in North America. The trade of Canada has gone on increasing at an equal rate at least with its population; its chief exports are wheat and timber to Great Britain and the United States, the latter of which countries seems likely to become the principal market for its produce. Our other North American colonies enjoy a like prosperity, though in Newfoundland, while the population has rapidly augmented, the fisheries, the chief resources of that island, have from many causes declined in profit, though not in actual productiveness. Our shrewd and humorous friend Sam Slick, the Clockmaker, has frequently twitted the Nova Scotians for their inertness in turning to good account the many natural advantages of their country. The following observations appear to countenance his views:—

"By the treaty of 1783, explained by a convention in 1818, the Americans enjoy the right of fishing, if not less than three miles from the shore (of Nova Scotia), and even of putting into the harbours, should they stand in need of repairs, wood, or water. The New Englanders, possessing a larger capital, and making fishing a separate business, carry it on more skilfully, and, it is said, draw a greater produce from the seas surrounding Nova Scotia than the natives themselves. The stranger approaching the coast sees it bordered by long lines of shallops, busied in drawing up the treasures of the deep; but he learns with surprise, that so far from having any connexion with the country which lies before him, they belong to a rival state, three or four hundred miles distant. It is alleged, also, that by loosening a jib-boom, or by emptying water-casks during the night, they easily reduce themselves to such a state of distress, as may entitle them, under the act, to enter a harbour. An active barter then commences, and articles suited to the market are exchanged for the best of the fish taken by the natives. This, however, though it may injure the revenue, must often be advantageous to the fishermen, who thereby obtain a readier return for their produce than by the tedious process of curing and exporting. On the whole, without entering into difficult questions of maritime international law, we may observe that a positive agreement, even if rashly made, seems scarcely to admit of remedy; and we may hope that the advancing industry and capital of the country will ultimately prove more than equal, on its own shores, to the enterprise of rivals carrying on the fishery under so many local disadvantages."

The New Englanders, it ought to be observed, carried on the fisheries of the shores of Nova Scotia before the present race of colonists existed in that country. They have, therefore, besides the advantages of superior capital and long experience,

that entire pre-occupancy which operates in so discouraging a manner on the first attempts at mercantile competition. Much of the general backwardness which has been complained of (chiefly with a reference to the superior activity and enterprise of the neighbouring Republican States,) in Nova Scotia and New Brunswick, may be ascribed to the ill-judged facility with which large tracts of land have been heretofore granted to absentee proprietors, who neither improve it themselves, nor are willing to dispose of it to others for its actual value. A measure recently proposed for levying an additional tax on all such owned, but unoccupied and unimproved lands, will probably lead to the gradual correction of the evil.

The third and last of the volumes on British America contains, among other matters, the complex question of emigration, treated at considerable length, and with all the details absolutely necessary for the guidance of an intending settler. The bare fact that, in the seventeen years from 1821 to 1837 inclusive, not fewer than 346,269 souls (averaging 20,000 annually,) emigrated from the British islands to our North American colonies, chiefly Canada, is sufficient to establish the great importance of those possessions. In 1832, the emigrants to British America amounted to 51,746. Last year, owing to the alarm created by the insurrectionary movements, the number of emigrants to Canada was reduced, we believe, to 5,000; but the daily papers inform us that the stream of emigration to that country has already nearly recovered its former fulness; and that the arrivals of settlers at Quebec, in June this year, exceeded those of last year by 3,000.

With respect to the advantages which individuals may expect to derive from emigration, the remarks of Mr. Murray are just and dispassionate. He properly scouts the idea of fortunes being made by agriculture in the backwoods, and forcibly points out to the intending emigrant, that the possession of land, which in Europe confers so much importance on individuals, is not in new countries a sure token of either opulence or respectability. "A large capital," he says, "with a view to procure wealth, must be employed chiefly in mercantile transactions." Again, he observes, "the wealth expected to be found in the forest proves a chimera: to the settler, extensive property is only a waste of woodland, which he has no means of turning to account; the price of everything, except the necessaries of life, is higher; and his income therefore does not go nearly so far." These remarks, however, do not amount to, and are not intended to go the length of, absolute discouragement; but they fully prove that the business of emigration is not one which can be engaged in advantageously by all classes of persons, no matter what may have been their previous habits and mode of life; but that it requires as much appropriate knowledge as any other pursuit, with perhaps more than usual circumspection. We must not close these excellent volumes without mentioning that the maps and woodcuts with which they are liberally illustrated, exhibit the same carefulness and judicious estimate of the wants of the reader, which characterize the literary portion of the work.

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*Minor Morals.* By John Bowring. Part III. Edinburgh, Tait.

We sufficiently described the nature and character of this work heretofore. The tales in the present Part have reference to the East, and will be found both amusing and instructive. But our purpose in bringing the work prominently forward, is simply that we may extract from it the Doctor's account of Mahomet Ali,—a subject, at the present moment, of perhaps more interest to parents than children, for whose amusement it was written.

"He was born at Cavalla in Roumelia, and he told me he was the youngest of sixteen children. He was much indulged by his father and mother, and was a great favourite of his brothers and sisters. He once said to me, 'Do not wonder if I am sometimes impatient and want to have my own way. I was never used to contradiction. I have scarcely ever known misfortune. I was born under a smiling star, and that star has smiled upon me all my life through.' * * Mahomet Ali was forty-six years old before he had learned either to read or to write. This he told me himself. I have heard that he was taught by his favourite wife. But he is fond of reading now; and one day, when I entered his divan unannounced, I found him quite alone, with his spectacles on, reading a Turkish volume, which he was much enjoying, while a considerable pile of books were by his side. 'It is a pleasant relief,' he said, 'from public business; I was reading some amusing Turkish stories' (probably the Arabian Nights); 'and now let us talk—what have you to tell me?' There is a great deal of sagacity in Mahomet Ali's conversation, particularly when he knows or discovers, as he usually does, the sort of information which his visitor is most able to give. He discourses with engineers, about mechanical improvements—with military men, on the art of war—with sea-officers, on ship-building and naval manœuvres—with travellers, on the countries they have visited—with politicians, on public affairs. He very willingly talks of foreign countries, and princes and statesmen, and is in the habit of mingling in the conversation all sorts of anecdotes about himself and the events connected with his history. His phrases are often poetical, and he, like most Orientals, frequently introduces proverbs and imagery. I heard him once say, speaking of the agriculture of Egypt, 'When I came to this country I only scratched it with a pin, I have now succeeded in cultivating it with a hoe; but soon I will have a plough passing over the whole land.' You asked me, George, if he were not a cruel Prince? and that he certainly is not, for many a generous deed has he done, and seldom will it be found that the reign of a Turkish sovereign is so little stained with blood.—When I was at Cairo a number of Levantine merchants had got deeply and, I fear, dishonestly in debt to the Pacha. Payment had been urged in every possible way, but in vain. At last the Pacha got impatient, for the amount was large (exceeding 100,000*l.* sterling), and he directed them to be seized, sent to the galleys for life, and all their property to be confiscated. It happened that an Englishman of distinction and myself were applied to by their distressed families to intercede with the Pacha, and to implore mercy, less on account of the imprudent debtors than of their numerous families. We urged the excess of punishment, with reference to the offence, falling upon the innocent more heavily than on the guilty. We talked of the gentle quality of mercy—blessing the giver as much as the receiver—and the old man's heart was touched, and he forgave the debtors. * * I feel a great interest in Mahomet Ali, and the more so because I have had the advantage of seeing him with his children and grandchildren around him, and of talking with him about domestic matters. In the East it is very difficult to learn much about the private concerns of any Turk, and still less of those of men of high station. Mahomet Ali's great pride is Ibrahim Pacha; a victorious leader is always an object of admiration among Mussulmans, and Ibrahim Pacha's career has been one of brilliant military success. His father is fond of talking of his first-born son and intended successor. 'I did not know him,' he said—'I had not an unbounded confidence in him for many, many years; no, not till his beard was almost as long as my own, and even changing its colour,' said the Pacha to me, 'but now I can thoroughly trust him.' On the part of Ibrahim Pacha, though in rank above his father (for the Pacha of the Holy Cities is the first Pacha of the Ottoman Empire), there is always the utmost deference to Mahomet Ali's will. In the most difficult circumstances of his life he has always referred to his renowned sire for advice, and whenever he has been pressed by the representatives of the great powers of Europe, he has invariably answered, that he should abide by the instructions he received from his father. Of the sons of Mahomet Ali, Toussoun, the second, was long the favourite. He was a prince of a generous, not to say extravagant disposition; and when, on one occasion, he was reproached by his father for his prodigality, he answered, 'It may be well for you to be economical, who were not born what you are, but I am the son of Mahomet Ali *Pacha*, and the son of a Pacha must be liberal.' His father smiled, the answer flattered his sense of dignity, and he upbraided Toussoun no more. Not long after Toussoun died of the plague. A third son, Ismail, was murdered by the blacks in Sennar, the hut in which he was being surrounded by brushwood, set on fire, and he perished in the flames.' * * 'I have been very happy in my children,' he said to me one day; 'there is not one of them who does not treat me with the utmost deference and respect; except,' he added, laughing outright, 'that little fellow, the last and the least of all, Mahomet Ali.' He was then a boy of five or six years old, called by his father's name—the son of his old age—his Benjamin—his best beloved. 'I see how it is,' I said; 'your Highness spoils the boy. You encourage the little rogue.' Mahomet Ali laughed again—it was an acknowledgment of a little paternal weakness. Not long after, I was in the Palace of Shoubra—it was on a Friday, the Mussulman sabbath, when the Pacha is in the habit of receiving all his family. I found him in the centre of his Divan. He was surrounded by all his sons and grandsons, who were then residing at Cairo. He had been listening to the accounts of their studies—of their amusements and their employments. Abbas Pacha, the eldest son of Toussoun Pacha, sat next his grandfather, and the rest of the family were seated on chairs, according to their ranks and ages. After some conversation, Mahomet Ali told his descendants that they might now withdraw. One after another they rose, knelt before him, kissed the hem of his garment, and retired. Little Mahomet Ali came last; he was dressed in military costume, with a small golden-cased scimitar dangling at his side. He advanced towards his father—looked in his face; he saw the accustomed, the involuntary smile; and, when he was about a yard from the Pacha, instead of bending or saluting him, he turned on his heels, and laughingly scampered away, like a young colt. 'I see how it is,' said I to Mahomet Ali. The old man shook his head—looked grave for a moment—another smile passed over his countenance—'Peki, peki!' said he, in a low tone, 'Well, well!' But I certainly did not like his Highness the worse for what I had just witnessed."

The Doctor, writing on Egypt, has of course a chapter on Magicians; but though he tells the tale of the impostures there practised, he does not, as too many writers have done, affect to believe in them. One anecdote of the celebrated Cairo magician is worth quoting. The man, it appears, has been so much exposed of late, and his failures have been so numerous, that he has sunk into obscurity. It will be remembered, no doubt, that he was accustomed to practise on the ignorant and superstitious young Arabs; and after certain incantations, he professed to show the reflection of any absent person named in a small quantity of ink, which he poured into the hand of the youth: and no doubt the reader has heard the story of Nelson and his one arm. On one occasion, however, he undertook to practise on an intelligent English youth:—

"And, after he had made his preparations, and filled the boy's palm with ink, he asked him whether he saw anything. The boy looked and looked—said, 'No! nothing!' at first; but at last cried out, 'O, yes! O, yes! I see, I see something!' Upon which all the company cried out, in great excitement, 'And what—what do you see?'—'I see,' said the boy—'I see my own nose!'"

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*The Polemic Divine: or Memoirs of the Life, Writings, and Opinions of the Rev. Daniel Isaac.* By James Everett. Hamilton, Adams, & Co.

The literary dearth, by which this present year of Chartism may, possibly, make itself remembered in "the Row," has been in no respect more severe than in the article of biography.

But it is not merely the scarcity which makes us relish this Life of Daniel Isaac. Were the memorials of departed worth, genius, and learning "plenty as blackberries," we should still keep a corner for any fresh leaves from Mr. Everett's Book of Worthies. We know him of old, to be happy in the choice of his subjects, and skilful in his treatment of them. The reader, by his name, is prepared for a Methodist biography; and, if he be given to speculate on the shades of diversity and schism in religious belief, it is with interest that he will avail himself of any new channel by which he may penetrate into the thoughts and doings of a large body of men, with whom, following the order of nature, the increase of numbers and opulence has been accompanied by a departure from some of their sterner original peculiarities,—and who have learned not only to endure but to imitate the forms of Mother Church, with such a ready acquiescence, that the observer may, without embarking in any Utopian speculations, calculate how soon the slight barriers of separation will be thrown down, and, the two parties embracing, coalesce.

But even the idler reader, who augurs little from the discussion of the "Leeds Question," and cares less how largely or how sparingly liturgies and organs are adopted by the Wesleyans, will not, if sound at heart himself, turn away from the life of a true man—such as was Daniel Isaac. The Polemic Divine, though industriously devout and fervently zealous, was not one of those uplifted by his enthusiasm above all the promptings and desires of mortality; he was humorous as well as pious—temperate and homely in his habits, without any sanctimonious renunciation of the comforts of life. He knew the worth of a good story as well as of a good sermon;—less eccentric than Rowland Hill, and perhaps less book-learned, but, like him, endowed with the peculiarities which rivet attention, as well as the qualities which engage affection. Add to this, that he retained those closest sympathies for the humbler classes which should eminently, but do not always, characterize those who have risen from the ranks, and the reason for the popularity and influence he acquired, is, we think, given "in little."

Daniel Isaac—born in 1778—was the son of a farmer who lived at Caythorpe, in Lincolnshire. The family filled a respectable station, but the simple habits of the time and the neighbourhood in which they lived are pleasantly illustrated by Mr. Everett's anecdote of the timidity caused, in the subject of his memoir, by the sight of a carpet, encountered in a house at Grantham—upon which the young Daniel durst hardly set his feet. Yet Daniel was anything but a dull clodhopper; his love of learning was evident at an early period, and, "while still in his boyhood, he spent some of his leisure hours from school in going into the fields and woods, to collect crowquills, and in making pens from the wing of the Lincolnshire goose, which he carried to the nearest market towns, sold to the stationers and booksellers, and made literary purchases with the cash." Neither, though educated by serious parents, did he deny himself in his youth the "amusements of singing, dancing, and card-playing," upon the strength of which remembered and repented vanities so many a good man has, like Charles Lamb's Quaker-preacher, in riper years, denounced himself, as having been "a wit in his youth." He was designed for a tutorship in a school, or a desk in a banking-house, and accordingly, for some short time, filled both situations—in the latter capacity, earning for himself that flimsiest of all reputations, which is acquired by gaiety of dress, paving the way, by recoil, for his personal slovenliness in after years, which, if not positively expressed, is to be "elegantly understood" in Mr. Everett's pages. And, in fact, having joined the Methodists in the midst of his puppy age, his first appearance among them was "like that of a golden pheasant among the poultry of a farmyard,"—he having conscientiously and sensibly bound himself to the use of his heterodox apparel, till it was worn out. He gave up the banking-house about the same time, and then took to school-keeping for his maintenance, but presently found the care of riotous children so irksome that he soon shut up his school, and applied himself to learn the humbler, but less distracting trade of a linen-weaver. He was not, however, long to be tied to the loom; for his gifts and graces had been recognized by the Methodist authorities, and he was permitted to try his hand at itinerant preaching. Early in his career he began to exhibit some characteristic peculiarities: on the occasion of "a watch night," for instance, he selected, by way of text, Tom Paine's 'Age of Reason,' and expounded the same polemically. By this time his outward man was utterly changed—when more regularly appointed to a circuit,—

"His pedestrian qualifications were here brought into full exercise; and to save the circuit the expense of a horse, as well as to insure himself labour, he walked to the whole of the places. In some of his longer journies, when he ought to have carried 'light weight,' on account of the distance, he was sometimes the most heavily laden, owing to the length of time he had to be from home. On these occasions he packed his saddle-bags full of books, papers, and linen,—threw them upon his shoulder, with one end before and the other behind,—buckled them round him with a strap, in order to keep them steady,—and then, in this grotesque form, trudged to his appointments through the fields, lanes, villages, and along the highways, as though he had either sold his horse at the fair, or had the misfortune to lose him by accident."

In the same page, we find a notice of his controversial dispositions, breaking out in a denunciation of the opinions of Swedenborg; for the love of the marvellous, which is encouraged rather than discountenanced among the Methodists, naturally disposes them to lend a too friendly ear to the rhapsodies of the Baron and his followers. The "Polemic Divine" himself spent some time in working out "the number of the Beast," and Mr. Everett gives his calculations. But we are bound to remark that the courageous uprightness of Mr. Isaac's nature was manifested in his intercourse with his congregations yet more than in his discourses on abstract matters. Mr. Everett gives us more than one proof of his having drily and firmly rejected that interference and dictation to which so many of the timid and self-seeking have quailed. And it is a fact, to the credit of the voluntary system, that so sturdy and plain-speaking a personage should rise to a position of weight and importance. We must select such anecdotes illustrative of his career as a preacher, as will be accepted and appreciated beyond the circle of the Tabernacle.

"Much as he loved his study, he never permitted it to engross the time which belonged to his other ministerial duties: nor had it the smallest tendency to produce the effeminacy which shrinks from itinerant toil. On one occasion, he had been dining with a friend, in the depth of winter, during a heavy storm of snow. His place for the evening lay some miles wide of Newcastle; the place itself was small,—he had to walk to it,—and the congregation was extremely slender at all times. The streets were nearly swept of passengers, and the snow was drifting in every direction. These, together with health, personal safety, and the probability of having none except the family of the house to hear him, were all employed as arguments to prevent him from going. He stood in the shop a few minutes, with his travelling dress on, and his staff in his hand, apparently balancing the reasons for and against the journey. Just then, he saw a horse and cart passing; and pointing the hand to the snow-clad driver,—'See,' said he, 'that poor fellow; the way is as clear for me as it is for him; and my business, I am sure, is full as important.' So saying, he bolted out at the door, and went to his appointment."

At another time, while he was on the North Shields circuit, we find him standing up in the midst of the colliers, who were then in a state of disturbance, using his powers of authority and persuasion,—undismayed by menaces and measures of violence,—with such success that, according to the phraseology of his sect, "the lions were turned into lambs," while his polemic tastes found full occupation in refuting the statements which had appeared in the local papers, and which had ascribed the disturbances of the district to Wesleyan influences. To return to our anecdotes:—

"The pulpit and the temple were not always exempt from the ludicrous. Though few men could sleep under Mr. Isaac, yet in one instance, a man who had been sleeping some time unobserved, rendered himself rather conspicuous by giving an uncommon yawn, before he was aware of the place where he was. Mr. Isaac looking towards him, and with something like affected pity, said, 'I am sorry I have disturbed you,'—giving the notion of an obtrusion upon the sick, whose chamber and repose it was improper to disturb. The effect, he remarked afterwards, upon his own mind, was such, that he never before had such a struggle with himself, to prevent bursting into a fit of laughter. His own address—the unexpected sound,—the wildness, surprise, and confusion of the man, in staring round the chapel, before and after he was fully awake to his situation, were almost too much for him."

"He was requested, in the course of the first year of the present station, to open Appleton Chapel. The Bible belonging to the pulpit was afterwards sent into the city of York to rebind, when a friend was not a little amused to find written by Mr. Isaac, on one of the blank leaves, the following address, which may not be without its use in certain quarters:

"To all Bible Thumpers.

"Gentlemen,

"You, are certainly required 'rightly to divide the word of truth;' but I must beg leave to remind you, that, to thump me to pieces, is not to divide me 'rightly.' How can you persuade others to regard me with reverence, when they see you treat me with such shocking abuse?"

We can only notice incidentally Mr. Isaac's antagonism to the Rev. Sydney Smith, who was then "charging" the Methodists at full tilt in the *Edinburgh Review;* as also his more amiable intercourse with the Rev. Robert Hall; and we shall pass over the prominent part taken by him in the several controversies which have of late years agitated and all but broken up the Wesleyans,—the man, not the Methodist, being the matter in hand. Here is another instance of the care with which he watched over the interests of the poor:—

"He was generally opposed to needless expense in chapels; looking chiefly at comfort and convenience. Walking one Friday evening down the aisle of a large chapel, when the gas-lamps were lighted for the first time, preparatory to the Sabbath, the manager, who was a leader, was a little desirous of his opinion of the *coup d'œil*. 'Very bright,—very bright!' said Mr. Isaac. 'But look at the free seats, Mr. Isaac,' said the manager; 'do you not admire the alteration?' 'O yes,' he replied hastily, 'the free sitting is very good,—what there is of it.' 'Recollect, Sir,' it was observed by way of apology, 'this chapel cost six thousand pounds!' 'A thousand pounds,' subjoined Mr. Isaac, 'have been thrown away, upon needless ornaments.' 'Don't be so hard, Sir,' was the return; 'we had an eye to the respectable people.' 'Mere fudge, I tell thee, friend B.,' was responded; 'what do they do when you get them?' 'Be serious, Sir,' said the interlocutor: 'you know the soul of a rich man is worth as much as the soul of a poor man.' 'Come, come, brother B., you talk nicely now,' replied Mr. Isaac; 'that is capital logic; and to it, I can oppose no objection.

According to your showing, the poor—of equal worth, ought to have had half of the chapel; and I believe the Divine Being is of my mind: he would have liked you and the chapel much better, if you had permitted the *poor* to have a little more elbow-room.'"

There is good sense and good humour in the following anecdotes:—

"Being invited to attend a funeral, he entered a large room, crowded with a number of guests, and a sumptuous cold collation. He whispered to a friend, —'They appear to be wiser than Solomon here!' 'How so?' was inquired. 'Solomon, you know, tells us, it is better to go to the house of mourning than the house of feasting; but they have managed to put them both together!'"

"When induced to leave home, he was always excellent company. His friend, Mr. Welch, whose debt of obligation for several anecdotes has been already noticed, and some others were on board of a Steam-Packet, on their way to a Missionary Meeting. 'What is that you are reading, brother R.?' Mr. Isaac inquired. 'The Natural History of Enthusiasm,' was the reply. 'O, very good,' returned Mr. Isaac; 'but put up your book, if you please, and let us have a little talk.' Then, looking to Mr. W., he observed in an under-tone, 'I rarely read books on a journey. When I travel, I read men; books are only substitutes for men. I look about me, and see the exemplification and effects of principles. When I cannot read *men*, I read *things*. Besides, the practice, if carried out, would induce an isolated repulsive caste, worse than in India. We should have an octavo thumping against a duodecimo in the street, and a hurricane carrying away a pamphlet —hat—wig—and altogether.'"

One more trait, for the sake of its sly touch of nature:—

"With his pipe in his mouth—his bason of milk before him—and a little toast, often browned by himself,—broken into fragments—and fished up by the point of the penknife out of the liquid, as his evening repast, he envied not the luxury of a court, but threw a sunshine of comfort around the social circle, and could even enjoy the opposition and puns of an antipipite. On one occasion, an elderly lady entered the room, and seeing him engaged with the pipe, lifted up her hands, and exclaimed, as if partially shocked at the sight of so much self-indulgence, —'Aye, Mr. Isaac, you are at your *idol* again!' Looking up at her, with one of his quiet, yet pleasantly demure expressions of feature, he returned —puffing out a cloud of smoke,—'Yes, *I am burning it.*'"

But we must have done with honest and devout Daniel Isaac. Other features of his character—in particular his disinclination to personal display, to anything like spiritual lionism,—being merely referred to in general terms. Enough to say, that we have read through his Life with pleasure, and cannot close it without recommending it to all such as love what is earnest and genuine, whether it go forth licensed by a Bishop or a synod of nonconformists.

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*Memoirs of the Count Rostoptchine, written in Ten Minutes*—[*Mémoires du Comte Rostoptchine, &c.*] Paris.

This *jeu d'esprit* of the French press is so brief, that if we were to say all that it suggests to us, as critics and journalists, our article would be longer than its subject, without being half so pleasant. We are informed, in a preliminary advertisement, that "a lady having told the Count that he ought to write his own life, he brought her this memoir on the following morning;" and we are further informed, in a "post-liminious preface," on the authority of "the universal portable biography of contemporary celebrities," that when the hero of Moscow came to Paris, all the world was surprised to discover in the ferocious Tartar of French imaginations, an amiable man of *bon ton*, a professed wit and utterer of *bons mots*. Here, then, is a theme for one dissertation: are we, or are we not mystified? Is the autobiography authentic, or is the whole a pure "invention of the enemy"? At the back of this comes a second diatribe, treatise, or whatever it may be called, on the characteristics of the French and English press, and on the very different states of public opinion, which determine their respective forms and spirit. Incidental to either, or to both of these subjects, we arrive at a third matter of investigation, namely, the climate of Russia—whether such a climate might, could, would, or ought to produce such a compound of Voltaire and of Beaumarchais, such a mixture of the Cynic and the Epicurean, as the author of this *bluette* must be? All these things are necessary to be known, in order to the writing of a proper critique on the ten minutes memoir. But we must not renew the phenomenon of Dr. Parr's wig [*vide Edinburgh Review*, No. I.], and, to avoid the necessity, we shall leave these discussions to a better opportunity, giving our readers the best means of judging for themselves of the work in question, by a copious extract, embracing no less than the whole of its contents:

Chapter I. *My Birth.* In 1765, on the 12th of March, I entered on the light of day. They measured me, weighed me, baptized me. I was born without knowing why; and my parents rejoiced without knowing for what.

Chap. II. *My Education.* They taught me all sorts of things, and all sorts of languages; so that by dint of impudence and quackery, I sometimes passed for a man of learning. My head became a library of odd volumes, of which, however, I have myself kept the key.

Chap. III. *My Torments.* I was plagued with masters, with tailors, who would make my clothes too small; by the women, by ambition, by self-love, by vain regrets, by *sovereigns*, and by *souvenirs*.

Chap. IV. *Privations.* I have been deprived of three of the greatest enjoyments of humanity; theft, gluttony, and pride.

Chap. V. *Memorable Epochs.* At thirty, I gave up dancing—at forty, pretension to pleasing the ladies —at fifty, respect for public opinion—at sixty, thought, when I became a true philosopher, or an egotist, which comes to the same thing.

Chap. VI. *Moral Portrait.* I was obstinate as a mule, capricious as a coquette, gay as a child, idle as a marmot, active as Bonaparte, and all of these in turn, at pleasure.

Chap. VII. *Important Resolution.* Never possessing a command of my physiognomy, I gave loose also to my tongue, and acquired the bad habit of thinking aloud. This procured me some amusement and a multitude of enemies.

Chap. VIII. *What I was, and what I might have been.* I was sensible of friendship and of confidence; and I wanted nothing but to have been born in the golden age, to have stood some chance of being a perfectly simple, i. e. a good man.

Chap. IX. *Respectable Principles.* I never was engaged in any affair of marriage or of gossip. I never recommended either a cook or a physician; consequently I never attempted the life of any man.

Chap. X. *My Tastes.* I was fond of small societies, of a walk in the woods. I had an involuntary veneration for the sun, and its setting has often made me melancholy. As for colours, I preferred blue; in eating, beef and horseradish; in theatricals, comedy, and farce; in human beings, an open and expressive countenance: hunchbacks of both sexes had a charm for me which I cannot explain.

Chap. XI. *My Aversions.* I always had a dislike to fools, scoundrels, and female *intriguantes* who pretend to virtue; I was disgusted with affectation, pitied painted dolls of both sexes; hated rats, liqueurs, metaphysics, and rhubarb; and entertained a positive alarm at justice and mad dogs.

Chap. XII. *Analysis of my Life.* I wait for death without fear and without impatience. My life has been a bad melo-drama, in which I have played heroes, tyrants, lovers, fathers, everything but valets.

Chap. XIII. *Rewards from Heaven.* My supreme blessing in life has been an independence of the three Great Powers that govern Europe. Rich, averse to business, and indifferent to music, I had nothing to do with Rothschild, Metternich, or Rossini.

Chap. XIV. *My Epitaph.* Here is left to repose, with a mind fatigued, a heart exhausted, and a body worn out, an old fellow (*vieux diable*) deceased: ladies and gentlemen, pass on.

Chap. XV. *Dedicatory Epistle to the Public.* Dog, discordant organ of the passions, you, who elevate to the clouds and plunge into the mud; who patronize and calumniate without knowing why; image of an alarm bell, echo of yourself; absurd tyrant, escaped from the madhouse, extract of subtle poisons and of sweet aromas, representative of the devil at the court of human nature; Fury, in the mask of christian charity,—Public, whom I feared in my youth, respected at maturity, and despised in my old age, it is to you that I dedicate these memoirs. My good friend, I am at last out of your fangs; for I am dead, and therefore deaf, dumb, and blind. Would that you enjoyed the same advantages,—for your own repose and for that of humanity.

Having thus presented to our readers the body of the work, we must add the pith of the post-script, consisting of a mot of Rostoptchine's, and an anecdote. The Count said, we are told, that he visited France to judge more accurately of three great men,—Fouché, Talleyrand, and Potier,—and the last alone proved on inspection equal to his reputation.

Being asked by Paul the First, when in company with several Russian princes, why he was not a prince, he replied, "because his Tartar ancestor settled in Russia in the winter season." Upon being pressed to explain, he continued, "it was the custom of the Emperors of Russia, on such occasions, to give the settler the choice of a principality, or a pelisse. Now, my ancestor, arriving in a very cold winter, had the wit to choose the pelisse." Paul laughed heartily, and congratulated the princes on their ancestors having settled in the summer season.

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## REPORT OF THE PRESIDENT AND COUNCIL OF THE ROYAL SOCIETY

*On the Instructions to be prepared for the Scientific Expedition to the Antarctic Regions.*

[Concluded from p. 620.]

### Section V.—INSTRUCTIONS FOR MAKING METEOROLOGICAL OBSERVATIONS.

The Council of the Royal Society, while they have been occupied in preparing instructions for making meteorological observations at the fixed magnetic observatories about to be established by the Government at Montreal, St. Helena, the Cape of Good Hope, Van Diemen's Land, and the different stations to be visited by the Antarctic Expedition under Captain James Clark Ross, and in reporting on various references made to them of applications for instructions for similar observations by the Secretary of State for the Colonies, the Honourable Court of Directors of the East India Company, and the Corporation of the Trinity House, have availed themselves of this opportunity for proposing a plan of extensive co-operation, the general adoption of which by observers cannot fail to produce the most advantageous results to meteorological science.

After maturely considering the subject, they do not presume to anticipate that what they may suggest will not be liable to objections, for their object will be to include within their compass many excellent series of observations which are already in progress, rather than to propose a degree of theoretical perfection, the attainment of which the present state of the science may not perhaps admit of. Systematic co-operation is the essential point to which, at present, everything else should be sacrificed; and co-operation on almost any plan would most certainly be followed by more beneficial results than any number of independent observations, however perfect they might be in themselves.

The plan of co-operation should, in fact, be regarded at present as merely temporary and preparatory, but if steadily adhered to for a few years it would certainly furnish the most perfect data for its own correction, which could then from time to time be applied with facility and precision.

The Council are not without hopes that amateurs of science may be induced to conform to these suggestions, even at the temporary sacrifice of their own views and convenience; for no one can reflect on the immense amount of labour which is now rendered useless for want of the requisite uniformity and precision, without being convinced of the necessity of remedying an evil which has already been of too long standing, and continues to be a reproach to science. Many, of course, will not have it in their power to fill up the plan in all its details; but they will contribute greatly to forward the design, if, in such observations as they may find it convenient to make, they strictly comply with the rules proposed. They will be further encouraged to lend their aid to a comprehensive system, by the consideration that it will be adopted by the Government observatories, as well as by those about to be established by the East India Company, and will of course be acted upon in the comparison and discussion of the observations made at these institutions by the scientific authorities who will be intrusted with the execution of this task.

The suggestions which the Council wish to offer will relate: 1st, to the times of observation; 2ndly, to the situation of the instruments to be observed; 3rdly, to the correction of the observations; 4thly, to a form of registry, which may place many of the results in a striking point of view, and facilitate comparisons.

#### 1. Barometers.

*Times of observation.*—The purposes of meteorological observations would be most perfectly and most expeditiously obtained by hourly observations throughout the year; but as at present such a course of unremitting labour cannot be hoped for, it is necessary to select periods, at longer intervals, calculated to embrace the extremes of the periodical oscillations to which the pressure of the atmosphere is subject, and to insure that uniformity of system at different stations on which the value of such observations so much depends. It is probable that the hours of 3 A.M., 9 A.M., 3 P.M., and 9 P.M., nearly coincide with the daily maxima and minima of the barometric column at the level of the sea, over a large portion of the globe; and it is desirable that as extensive a comparison as possible should be instituted at these hours.

It is not, however, too much to expect that in regular observatories hourly observations should be made for 24 hours once in every month; and when this cannot be effected, it is of the utmost importance that they should be made at least four times in the year, namely, at the summer and winter solstices, and at the spring and autumn equinoxes. One of the results of these hourly observations would probably be the indication of the exact times of the daily maxima and minima of pressure at different stations, which, if not found to coincide with the hours provisionally adopted, might ultimately be substituted for them under future directions.

Hourly observations at the equinoxes and solstices have been already instituted at numerous points, both of Europe and America, at the suggestion of Sir John Herschel, whose directions should be strictly attended to. They are as follows:—

The days fixed upon for these observations are the 21st of March, the 21st of June, the 21st of September, and the 21st of December, being those, or immediately adjoining to those, of the equinoxes and solstices in which the solar influence is either stationary or in a state of most rapid variation. *But should any one of those 21st days fall on Sunday, then it will be understood that the observations are to be deferred till the next day, the 22nd.* The observation at each station should commence at 6 o'clock A.M. of the appointed days, and terminate at 6 A.M. of the days following, according to the usual reckoning of time at the place.

The commencement of each hour should be chosen, and every such series of observations accompanied by a notice of the means used to obtain the time, and, when practicable, by some observation of an astronomical nature by which the time can be ascertained within a minute or two.

The Council now propose to extend these observations in regular series to the 21st of every month, with the same reservation with regard to Sundays.

It is to be hoped that in regular meteorological observations the six-hourly observations may not be found to be impracticable throughout the year; but in any case where it may be impossible to observe regularly at 3 A.M., an effort should be made to include the hour on the days of the new and full moon, and quadratures, or at least on the days of the new and full moon;—as it must be borne in mind that in what concerns the great meteorological questions on which the most interesting features of the subject depend, the night is quite as important as the day, and has been hitherto far too much neglected.

Whatever hours, however, may be selected for the regular series of observations, the greatest care should be taken not to substitute or interpolate in an irregular manner observations at any other hours.

It is much to be wished that occasional observations may be made under remarkable circumstances, such as during great rises or great falls of the barometer, at the period of great storms, earthquakes, &c.; but such observations should be registered apart.

The barometer should be placed in an apartment subject to as little variation of temperature as possible, and in a good light; and to facilitate night observations, an arrangement should be made for placing behind it a light screened by a sheet of white paper, or other diaphanous substance. Great care should be taken to fix it in a perpendicular position by the plumb-line. Its height must be carefully ascertained above some permanent and easily-recoverable mark, either in the building in which it is situated, or in some more permanent building, or rock, in its immediate vicinity; and no pains should be spared to ascertain the relation which such mark may bear to the level of high and of low water at spring tides, and ultimately to the mean level of the sea.

Changes in the adjustments of meteorological instruments should be most carefully avoided; but whenever any alteration may be absolutely necessary, they should be made with all deliberation, scrupulously noticed in the register, and the exact amount of the change thence arising in the reading of the instrument under re-adjustment ascertained. As far as possible, registers of meteorological observations should be complete; but if, by unavoidable circumstances of absence, or from other causes, blanks occur, no attempts to fill them up by general recollection, or by the apparent course of the numbers before and after, should ever be made.

The observatories established by the Government are furnished with two barometers each, of Newman's construction—the one a standard, and the other portable; and they are accompanied by accurate directions for fixing and observing them.

The standard instrument is of large dimensions, its tube being of the diameter of 0·6 inch. It requires two adjustments: 1st, The whole scale, which is of brass, is moveable, and terminates in an ivory point, which is carefully brought down to the surface of the mercury in the cistern, and the two are known to be accurately in contact when the actual point and its reflexion appear just to touch one another. The scale is laid off from this point from an authentic standard, at the temperature of 32°.

2nd, The second adjustment is that of the vernier, in which the upper part of the scale terminates to the surface of the mercury in the tube. For this both the back and front edge are made to coincide, and brought down so as to form a tangent to the curve, and just to exclude the light between them at the point of contact. In making both these adjustments, it is desirable that the eye should be assisted by a magnifying glass. Before the observation is made the instrument should be slightly tapped, to free the mercury from any adhesion to the glass, but any violent oscillation should be avoided.

The portable barometer has only one adjustment, namely, that of the vernier to the upper surface of the mercury in the tube, which adjustment must be effected with the same precaution as in the case of the standard instrument.

This first reading may be entered in the column prepared for it in the register, and beside it the temperature of the mercury carefully read off from the thermometer which dips into the cistern.

As, in the case of the standard barometer, the first measure is taken immediately from the surface of the mercury in the cistern, it requires no correction for the different capacities of the tube and cistern. Neither does it require any correction for capillary action, as the large diameter of the tube renders this correction inappreciable.

The portable barometer, however, requires corrections for both these circumstances. For the purpose of the former, the *neutral point* is marked upon each instrument, or that particular height which, in the construction of the instrument, has been actually measured from the surface of the mercury in the cistern.

It is obvious that in almost every case the mercury will stand either above or below the neutral point: if above, a portion of the mercury must have left the cistern to enter the tube, and consequently must have lowered the surface in the cistern; if below, a quantity of mercury must have left the tube, and, entering the cistern, raised the level of the mercury in it. For the correction of observations for this circumstance, the relation of the capacities of the tube and cistern have been experimentally ascertained, and are marked upon the instrument: thus, *capacity* $\frac{1}{30}$th, indicates that for every inch of elevation of the mercury in the tube, that in the cistern will be depressed $\frac{1}{30}$th of an inch. Thus, when the mercury in the tube is above the neutral point, the difference between it and the neutral point is to be divided by the capacity, and the quotient being added to the observed height, the result will be the corrected height. Or if the mercury at the time of observation should be below the neutral point, the difference of the two is to be divided as before, and the quotient to be subtracted from the observed height. Thus, suppose the capacity to be $\frac{1}{30}$th, the neutral point 30 inches, and the observed height 30·500 inches, the difference is 0·5 inch, which divided by 50 gives 0·01 inch to be added to the observed height, producing 30·51, the corrected height; or if the observed height be 29 inches, the difference, 1 inch, divided by 50, gives ·02 inch to be subtracted from the observed height, giving 28·980 inches for the corrected height.

The second correction required is for the capillary action of the tube, the effect of which is constantly to depress the mercury in the tube by a certain quantity inversely proportioned to the diameter of the tube. In the instruments furnished to the fixed observatories the amount has been experimentally

determined during their construction, and marked upon the instrument: the quantity is always to be added to the height of the mercurial column, previously corrected as before. For the convenience of those who may have barometers, the capillary action of which has not been so determined, a table of the corrections for tubes of different diameters is placed in the Appendix—(see *post*, p. 636.)

The marine barometers furnished to the Antarctic Expedition differ in nothing from the other portable barometers but in the mode of their suspension, and the necessary contraction of the tubes to prevent oscillation from the motion of the ship, and require the same corrections.

When these two corrections have been made in the first reading of the portable barometer, it should agree with the direct observation of the standard barometer, and it is very desirable that frequent comparative observations should be made of the two instruments, in order to ascertain whether there may be any permanent difference between them. Should this be the case, the amount may be marked upon the instrument, and allowed for as an index error, in order that, if an accident should happen to one, the other may be substituted for it without detriment to the regular series of observations.

It is to be presumed that the portable barometer will frequently be employed in ascertaining the altitude of remarkable points in the vicinity of the observatories, or of the more permanent stations of the expedition.

The instruments furnished to the observatories have been all independently graduated and compared with the standard of the Royal Society, and in all cases it is desirable that such a comparison should be made with some standard instrument of authority, directly, or by means of a good portable barometer. In making such comparisons, all that is necessary is to record five or ten simultaneous readings of both instruments, deliberately made, at intervals of a few minutes from each other, after at least an hour's quiet exposure, side by side, that they may have the same temperature. If compared by two observers, each should read off his own barometer in his usual manner, then each should verify the other's result. By this means the zero of one standard may be transported over all the world, and that of others compared with it ascertained. To do so, however, with perfect effect requires the utmost care in the transport of the intermediate barometer, and is by no means an operation either of trifling import or of hurried or negligent performance: some of the greatest questions in meteorology depend on its due execution.

The next correction, and in some respects the most important of all, is that due to the temperature of the mercury in the barometer tube at the time of observation. To obtain this, every barometer requires to have attached to it a thermometer, which in the instruments furnished to the observatories dips into the mercury in the cistern, and this must be read and registered at each observation of the barometer. In the Appendix (to the original Report) will be found a table calculated by Professor Schumacher, which gives for every degree of the thermometer and every half inch of the barometer, the proper quantity to be added or subtracted for the reduction of the observed height to the standard temperature of 32° Fahr.

It must, however, be observed, that this table is only calculated for barometers whose scales are engraven upon a rod or plate of brass reaching from the level of the mercury to the vernier. In many barometers the scale is engraved upon a short plate of brass fixed upon the wooden frame of the instrument, and the compound expansion of the two substances can only be guessed at, but must be obviously less than if the whole length had been of brass. As a near approximation for such imperfect instruments, another table has been placed in the Appendix, in which the lesser expansion of glass has been substituted for that of brass. No scientific observer, however, would willingly use such an instrument.

Although all these corrections are necessary for the strict *reduction* of registered observations, they ought not to be applied to individual observations previously to registry. In the blank forms of register furnished to the observatories, one sheet is devoted to uncorrected observations, and a second to the corrected, and it is much to be wished that the proper reductions should be made as soon after the observations as possible.

### 2. Thermometers.

*Times of observation.*—The external standard thermometer should be observed and registered at the same times as the barometer, and all the register thermometers may be read off at the time of the 9 A.M. observation, and their indices re-adjusted. But as double maxima frequently, and double minima occasionally, occur, in consequence of sudden changes of temperature, both the thermometers should be occasionally inspected with a view to ascertain whether the motion of either the mercury or the spirit has been reversed in an unusual manner; and such double maxima or minima should be recorded apart as *supernumerary*, with the dates and leading features of the case.

Each observatory has been furnished with a standard thermometer, of which duplicates have been deposited at the Royal Society, and which have been carefully compared with an authentic standard. With this standard it is recommended that all other thermometers be carefully and frequently compared, and their differences, at one or more temperatures (the wider asunder the better), marked upon their scales and applied as index errors. This is particularly necessary with the register thermometers, whose construction renders them most liable to such errors.

In placing the standard thermometer, an exposure should be chosen perfectly shaded from the sun, and one where no reflected sun-beams from water, buildings, rocks, or dry soil can reach it, and one which is easily accessible for observation. It should be *fixed*, not merely *hung*, upon a bracket projecting six inches from the wall or other support to which it may be attached, and it must be *completely* sheltered from rain by a screen, so that the bulb shall never be wetted. In reading it, the observer should avoid touching, breathing on, or in any way warming it by near approach of his person; and in night observations particular care should be taken not to heat it by approximation of the light. The quicker the reading is done the better.

Notice should, of course, be taken of all sudden and remarkable changes of temperature, although such occasional observations must not be recorded in the regular series.

The self-registering thermometers should be placed with the same precautions as the standard, and so fastened as to allow of one end being detached, and lifted up to allow of the indices within the tubes sliding down to the ends of the fluid columns, which they will readily do with the assistance of occasional tapping.

The self-registering thermometers are apt to get out of order by the indices becoming entangled, or from the breaking of the column of fluid. When this happens with the spirit thermometer, it may be rectified with ease by jerking the index down to the junction of the bulb and tube. The whole of the tube will at the same time become wetted with the spirit, and by setting it on end with the bulb downwards the spirit will run together into one continuous column.

When the steel index of the mercurial thermometer becomes immersed in the mercury, it must be jerked in the opposite direction till it, with the mercury which may be above it, is projected into the little bulb at the top of the tube. If this do not succeed, heat must be applied to the mercury-bulb, and when the index is fairly lodged in the air-bulb, by carefully warming the mercury-bulb with a spirit lamp having a very small flame, the mercury must be made to expand till it rises to the very top of the tube, and projects convexly into the air-bulb. The tube must then be placed upright, and, by tapping, the detached mercury will slip down beneath the steel index, and will fairly unite with the convex projection aforesaid. Now let the bulb cool, and the mercury will sink in one united column, and leave the index free.

Besides the regular series of observations of the temperature of the air, there are other occasional observations to be made of temperature under different circumstances, which might possess great interest.

The surface temperature of the water of the sea or of rivers may be conveniently obtained by taking up a bucket-full of water and stirring round the thermometer in it.

The temperature of the water of deep wells may be ascertained in the same way, and should be taken monthly, if near the residence of the observer. The temperature of rain should also be attended to at times; it may be determined by receiving the rain in a *linen* funnel, totally inclosed in a tin case to prevent cooling by evaporation from the linen.

The temperature of the soil at different depths is a point of considerable importance. For this purpose excavations should be made in a dry sheltered situation, 3, 6, and 9 feet deep, and lined with brick or earthenware tubes. In the bottom of these excavations earthenware quart bottles may be carefully placed, filled with water, spirit, or brine, and corked. They must be carefully covered within tow or cotton, and drawn up on the 21st of every month (being the day of horary observation), and their temperatures taken by an accurate thermometer, and registered apart.

As a general caution it may be mentioned, that the *standard* thermometer should never be exposed to risk by application to such purposes, but thermometers which have been compared and corrected by comparison with it.

### 3. Actinometers.

Amongst the observations of highest importance must be ranked those of the force of solar and terrestrial radiation. The most perfect means of observing the former is afforded by the actinometer.

This instrument consists of a large hollow cylinder of glass, soldered at one end to a thermometer-tube, terminated at the upper end by a ball drawn out to a point, and broken off, so as to leave the end open. The other end of the cylinder is closed by a silver or silver-plated cap, cemented on it, and furnished with a screw, also of silver, passing through a collar of waxed leather, which is pressed into forcible contact with its thread, by a tightening-screw of large diameter enclosing it, and working into the silver cap, and driven home by the aid of a strong steel key or wrench, which accompanies the instrument.

The cylinder is filled with a deep blue liquid (ammonio-sulphate of copper), and the ball at the top being purposely left full of air, and the point closed with melted wax, it becomes, in any given position of the screw, a thermometer of great delicacy, capable of being read off on a divided scale attached. The cylinder is enclosed in a chamber blackened on three sides, and on the fourth, or face, defended from currents of air by a thick glass, removeable at pleasure.

The action of the screw is to diminish or increase at pleasure the capacity of the hollow of the cylinder, and thus to drive, if necessary, a portion of the liquid up into the ball, which acts as a reservoir, or, if necessary, to draw back from the reservoir such a quantity as shall just fill it, leaving no bubble of air in the cylinder.

*To use the instrument*, examine first whether there be any air in the cylinder, which is easily seen by holding it level, and tilting it, when the air, if any, will be seen to run along it. If there be any, hold it upright in the left hand, and the air will ascend to the root of the thermometer-tube. Then, by alternate screwing and unscrewing the screw with the right hand, as the case may require, it will always be practicable to drive the air out of the cylinder into the ball, and suck down liquid, if any, from the ball, to supply its place, till the air is entirely evacuated from the cylinder, and the latter, as well as the whole stem of the thermometer-tube, is full of the liquid in an unbroken column. Then, holding it horizontally, face upwards, slowly and cautiously unscrew the screw, till the liquid retreats to the zero of the scale.

The upper bulb is drawn out into a fine tube, which is stopped with wax. When it is needed to empty, cleanse, and refill the instrument, liquid must first be forced up into the ball, so as to compress the air in it. On warming the end, the wax will be forced out, and the screw being then totally unscrewed, and the liquid poured out, the interior of the instrument may be washed with water slightly acidulated, and the tube, ball, &c. cleansed, in the same way, after which the wax must be replaced, and the instrument refilled.

*To make an observation with the actinometer*, the observer must station himself in the sunshine, or in

some sharply terminated shadow, so that without inconvenience, or materially altering his situation, or the exposure of the instrument in other respects, he can hold it at pleasure, either in full sun or total shadow. If placed in the sun, he must provide himself with a screen of pasteboard or tin plate, large enough to shade the whole of the lower part or chamber of the instrument, which should be placed not less than two feet from the instrument, and should be removeable in an instant of time. The best station is a room with closed doors, before an open window, or under an opening in the roof into which the sun shines freely. Draughts of air should be prevented as much as possible. If the observations be made out of doors, shelter from gusts of wind, and freedom from all penumbral shadows, as of ropes, rigging, branches, &c. should be sought. Generally, the more the observer is at his ease, with his watch and writing-table beside him, the better. He should have a watch or chronometer beating at least twice in a second, and provided with a second hand; also a pencil and paper ruled, according to the form subjoined for registering the observations. Let him then grasp the instrument in his left hand, or, if he have a proper stand (which is preferable on shore or in a building*), otherwise firmly support it, so as to expose its face perpendicularly to the direct rays of the sun, as exactly as may be.

The liquid, as soon as exposed, will mount rapidly in the stem. It should be allowed to do so for three or four minutes before the observation begins, taking care, however, not to let it mount into the bulb, by a proper use of the screw. At the same time the tube should be carefully cleared (by the same action) of all small broken portions of liquid remaining in it, which should all be drawn down into the bulb. When all is ready for observation, draw the liquid down to zero of its scale, gently and steadily; place it on its stand, with its screen before it, and proceed as follows.

Having previously ascertained how many times (suppose 20) the watch beats in five seconds, let the screen be withdrawn at ten seconds before a complete minute shown by the watch, suppose at $2^h\ 14^m\ 50^s$. From $50^s$ to $55^s$, say 0, 0, 0,....at each beat of the watch, looking meanwhile that all is right. At $55^s$ complete, count 0, 1, 2,....up to 20 beats, or to the whole minute, $2^h\ 15^m\ 0^s$, keeping the eye not on the watch, but on the end of the rising column of liquid. At the 20th beat read off, and register the reading (12°.0), as in column 3, A, of the annexed form.

| 1. Date and times of observation. Feldhausen, 1837, Oct. 30. | | 2. | 3. | | 4. | 5. | 6. |
|---|---|---|---|---|---|---|---|
| Initial. | Terminal. | Exposure, sun (⊙) or shade (×). | Readings of the instrument. A. Initial. | B. Terminal. | Change per minute. A—B. | Radiation in parts of scale. | Remarks. |
| h m s | m s | | | | | | |
| 2 15 0 | 16 0 | ⊙ | +12·0 | +43·3 | +31·3 | ..... | The times are reduced to *apparent* time, or to the sun's hour angle from the meridian. |
| 16 30 | 17 30 | × | 45·2 | 42·8 | − 2·4 | 34·75 | |
| 18 0 | 19 0 | ⊙ | 14·8 | 48·2 | +33·4 | 35·40 | Zero withdrawn. |
| 19 30 | 20 30 | × | 28·0 | 26·8 | − 1·4 | 34·85 | |
| 21 0 | 22 0 | ⊙ | 9·4 | 43·9 | +33·5 | 34·75 | |
| 22 30 | 23 30 | × | 46·6 | 45·5 | − 1·1 | 34·95 | |
| 24 0 | 25 0 | ⊙ | 9·0 | 43·2 | +34·2 | ..... | General mean per formula =34.73 for $2^h\ 20^m\ 0^s$ of apparent time. |

Then wait, watching the column of air above the liquid, to see that no blebs of liquid are in it, or at the opening of the upper bulb (which will cause the movement of the ascending column to be performed by starts), till the minute is nearly elapsed. At the 50th second begin to watch the liquid rising; at $55^s$ begin to count 0, 1, 2, up to 20 beats, as before, attentively watching the rise of the liquid; and at the 20th beat, or complete minute ($2^h\ 16^m\ 0^s$), read off, and instantly shade the instrument, or withdraw it *just out* of the sun and penumbra. Then register the reading off (43°.3) in column 3, B, and prepare for the shade observation. All this may be done without hurry in 20 seconds, with time also to withdraw the screw if the end of the column be inconveniently high in the scale, which is often required. At the 20th second prepare to observe; at the 25th begin to count beats, 0, 1, 2,....20; and at the 20th beat, i.e. at $2^h\ 16^m\ 30^s$, read off, and enter the reading in column 3, A, as the initial shade reading (45°.2). Then wait as before till nearly a minute has elapsed, and at $2^h\ 17^m\ 20^s$ again prepare. At $17^m\ 25^s$ begin to count beats; at $17^m\ 30^s$ read off, and enter this *terminal* shade reading (42°.8) in column 3, B, and, if needed, withdraw the zero.

Again wait $20^s$, in which interval there is time for the entry, &c. At $17^m\ 50^s$ remove the screen, or expose the instrument in the sun; at $55^s$ begin to count beats; and at the complete minute, 18 $0^s$ read off (14°.8), and so on for several alternations, *taking care to begin and end each series with a sun observation.* If the instrument be held in the hand, care should be taken not to change the inclination of its axis to the horizon between the readings, or the compressibility of the liquid by its own weight will produce a very appreciable amount of error.

In the annexed form, column 1. contains the times, initial and terminal, of each sun and shade observation. Column 2. expresses by an appropriate mark, ⊙ and ×, the exposure, whether in sun or shade. Column 3 contains the readings, initial and terminal (A and B). Column 4 gives the values of B—A, with its algebraical sign expressing the rise and fall per minute. And here it may be observed, that if by forgetfulness the exact minute be passed, the reading off may be made at the next $10^s$ and in that case the entry in column 4 must be not the *whole* amount of B—A, but only six-sevenths of that amount, so as to reduce it to an interval of $60^s$ precise. Column 5 contains the radiations as derived from successive triplets, ⊙×⊙, ×⊙×, ⊙×⊙, &c., by the formula presently to be stated; and in column 6 are entered remarks, such as the state of the sky, wind, &c.; as also (when taken) the sun's altitude, barometer, thermometer, and other readings, &c.

The formula of reduction is as follows. Let ⊙, ×, ⊙′, ×′, ⊙″, ×″, &c. represent the numbers in column 4, with their signs in order, as they stand, or the values of B—A. Then will the numbers in column 5 be respectively,

$$+\frac{\odot+\odot'}{2}-\times$$

$$-\frac{\times+\times'}{2}+\odot'$$

$$+\frac{\odot'+\odot''}{2}-\times'$$

$$-\frac{\times'+\times''}{2}+\odot''$$

and so on, the algebraic signs being carefully attended to. Thus,

$$34{\cdot}75=+\frac{31{\cdot}3+33.4}{2}+2{\cdot}4$$

$$35{\cdot}40=+\frac{2{\cdot}4+1{\cdot}4}{2}+33{\cdot}4,\ \&c.$$

The mean of a series not exceeding three or four triplets may be had by the formula

$$\frac{\odot+\odot'+\odot''+\&c.}{n}-\frac{\times+\times'+\&c.}{n-1},$$

where $n$ is the number of sun observations, the time corresponding being the middle of the middle shade observation.

A complete actinometer observation cannot consist of less than three sun and two shade observations intermediate; but the more there are taken the better, and in a very clear sunny day it is highly desirable to continue the alternate observations for a long time, even from sunrise to sunset, so as to deduce by a graphical projection the law of diurnal increase and diminution of the solar radiation, which will thus readily become apparent, provided the perfect clearness of the sky continue,—an indispensable condition in these observations, the slightest cloud or haze over the sun being at once marked by a diminution of resulting radiation.

To detect such haze or cirrus, a brown glass applied before the eye is useful, and by the help of such a glass it may here be noticed that solar halos are very frequently to be seen when the glare of light is such as to allow nothing of the sort to be perceived by the unguarded eye.

It is, as observed, essential that the instrument be exposed a few minutes to the sun, to raise its temperature in some slight degree. If this be not done, owing to some cause not very obvious, the first triplet of observations (sun, shade, sun) will give a radiation perceptibly in defect of the truth, as will become distinctly apparent on continuing the series. But it may be as well for a beginner to commence at once reading as soon as the instrument is exposed, and reject the first two triplets, by which he will see whether he has all his apparatus conveniently arranged, and get settled at his post.

When a series is long continued in a good sun, the instrument grows very hot, and the rise of the liquid in the sun observation decreases, while the fall in the shade increases; nay, towards sunset it will fall even in the sun. This phenomenon (which is at first startling, and seeming to impeach the fidelity of the instrument) is, in fact, perfectly in order, and produces absolutely no irregularity in the resulting march of the radiation. Only it is necessary in casting up the result (in col. 5.) to attend carefully to the algebraic signs of the differences in column 4, as in the following example (which, as well as that above given, is one of actual occurrence).

| 1. Date and times of observation. Wynberg, Nov. 24, 1837. | | 2. | 3. | | 4. | 5. | 6. |
|---|---|---|---|---|---|---|---|
| Initial. | Terminal. | Exposure, sun or shade. | Readings of the Instrument. A. Initial. | B. Terminal. | Change per minute. B — A. | Radiation in parts of scale. | Remarks. |
| h m s | m s | | | | | | |
| 6 5 15 | ..... | ... | ..... | ..... | ..... | ..... | Alt. of ⊙=7° 19′. |
| 9 0 | 10 0 | ⊙ | + 9·0 | + 9·7 | + 0·7 | | |
| 10 30 | 11 30 | × | 23·0 | 10·8 | −12·2 | 11·25 | |
| 12 0 | 13 0 | ⊙ | 34·0 | 31·4 | − 2·6 | 9·25 | |
| 13 30 | 14 30 | × | 28·5 | 17·0 | −11·5 | 8·20 | Cirrous haze coming on. |
| 15 0 | 16 0 | ⊙ | 12·0 | 8·0 | − 4·0 | | |
| 6 19 15 | ..... | ... | ..... | ..... | ..... | ..... | Alt. of ⊙=4° 37′. |

Every series of actinometer observations should be accompanied with notices in the column of remarks of the state of the wind and sky generally, the approach of any cloud (as seen in the coloured glass) near to the sun; the barometers and thermometers, *dry* and *wet*, should especially be read off more than once during the series, if a long one, and, if kept up during several hours, hourly. The times should be correct to the nearest minute, at least as serving to calculate the sun's altitude; but if this be taken (to the nearest minute or two) with a pocket sextant, or even by a style and shadow, frequently (at intervals of an hour or less) when the sun is rising or setting, it will add much to the immediate interest

* This may consist of two deal boards, eighteen inches long, connected by a hinge, and kept at any required angle by an iron, pointed at each end. The upper should have a little rabbet or moulding fitting loosely round the actinometer, to prevent its slipping off.

of the observations. When the sun is near the horizon, its reflection from the sea, or any neighbouring water, must be prevented from striking on the instrument. And similarly of snow in cold regions, or on great elevations in alpine countries.

Every actinometer should be provided with a spare glass, and all the glasses should be marked with a diamond; and it should always be noted at the head of the column of remarks which glass is used; as the co-efficient of reduction from the parts of the scale (which are arbitrary) to parts of the *unit of radiation* varies with the glass used.

In the case of the actinometers sent out with the expedition and to the fixed observatories, these co-efficients will be ascertained for each instrument and for each glass, *provided it be practicable to procure any observations of the sun in the interval before the sailing of the ships;* but at all events, an approximate value of the parts of the scale in *actines* will be given by measurement of the dimensions, and the glasses, as well as the cylinders and capillary stems of the instruments, if accidentally broken, should have their fragments carefully preserved and labelled.

The unit of solar radiation to be adopted in the ultimate reduction of the actinometric observations is the *actine*, by which is understood that intensity of solar radiation, which at a vertical incidence, and supposing it wholly absorbed, would suffice to melt one millionth part of a metre in thickness, from the surface of a sheet of ice horizontally exposed to its action per minute of mean solar time; but it will be well to reserve the reduction of the radiations as expressed in parts of the scale to their values in terms of their unit until the final discussion of the observations.

Meanwhile, no opportunities should be lost of *comparing* together the indications of different actinometers under similar and favourable circumstances, so as to establish a correspondence of scales, which, in case of accident happening to one of the instruments, will preserve its registered observations from loss.

The comparison of two actinometers may be executed by one observer using alternately each of the two instruments, thus,

| Instrument A. | Instrument B. | A. | Etc. |
|---|---|---|---|
| ⊙..... | ⊙..... | ⊙..... | |
| ×..... | ×..... | ×..... | |
| ⊙..... | ⊙..... | ⊙..... | |

beginning and ending with the same; though it would be more conveniently done by two observers observing simultaneously at the same place, and each registering his own instrument. An hour or two thus devoted to comparisons in a calm clear day, and under easy circumstances, will in all cases be extremely well bestowed.

Neither should each observer neglect to determine for himself the heat stopped by each of his glasses. This may be done also by alternating triplets of observation made with the glass on and off, thus,

| Glass off. | Glass on. | Glass off. | Etc. |
|---|---|---|---|
| ⊙..... | ⊙..... | ⊙..... | |
| ×..... | ×..... | ×..... | |
| ⊙..... | ⊙..... | ⊙..... | |

beginning and ending with the glass off, and (as in all cases) beginning and ending each *triplet* with a sun observation. For the purpose now in question, a very *calm* day must be chosen, and a great many triplets must be taken in succession. It will be found, that a single thickness of the ordinary bluish or greenish plate glass stops about 0·20 (= one-fifth) of the incident calorific rays. A second glass about 0·16 (or a materially less proportion) of those which have escaped the action of the first. No two glasses, however, are precisely alike in this respect.

Very interesting observations may be made by two observers furnished with well compared actinometers, the one stationed at the summit, the other at the foot of some great elevation, especially if the stations can be so selected that the observers shall be nearly in the line of the incident sunbeam at the time of observation, so as both to lie in the atmospheric column traversed by the rays. Many convenient stations of this kind might be found in mountainous countries, and by repeating the observation two or three times under favourable circumstances, interchanging observers and instruments, &c., and accompanying the observations with all circumstantial and local elements of precision, there is no doubt that the co-efficient of extinction of solar heat in traversing at least the lower strata of an atmosphere might be obtained with much exactness, and thus a highly valuable datum secured to science. The observers would, of course, agree to make their observations strictly simultaneous, and should, therefore, compare watches before parting.

The actinometer is also well calculated for measuring the defalcation of heat during any considerable eclipse of the sun, and the Council would point out this as an object worthy of attention, both at the fixed stations and on board the vessels; as many eclipses invisible or insignificant in one locality are great, or even total, in others. The observations should commence an hour at least before the eclipse begins, and be continued an hour beyond its termination, and the series should be uninterrupted, leaving to others to watch the phases of the eclipse. The atmospheric circumstances should be most carefully noted during the whole series.

Though out of the question in the circumstances immediately under contemplation, it may not be amiss to remind aeronauts, that observations of the actinometer may, no doubt, be made with considerable ease and precision in the car of a balloon, and if accompanied with good barometric and hygrometric simultaneous observations aloft and below, would in every point of view be most precious, thus adding one to the many useful subjects of inquiry in those hitherto almost useless adventures.

### 4. Radiating Thermometers.

As, however, the actinometer can only be observed at intervals in perfectly clear weather, additional information with regard to solar radiation, of much interest, though not of so precise a nature, may be obtained, by the daily register of the maximum temperature of a register thermometer, with a blackened bulb exposed to the full action of the sun's rays. It may be placed about an inch above the bare soil, and screened from currents of air. The maximum temperature indicated by such a thermometer, even in cloudy weather, will generally be considerably above that of the air, and the maxima and mean daily maxima of its indications will, after a long series of observations, afford data of the utmost value to the history of climates. The bulb of the thermometer should be about half an inch in diameter, and it may be uniformly blackened with lamp-black and varnish. The graduation should be made upon the glass stem, to prevent any inconvenience from the expansion and warping of the scale.

The measure of terrestrial radiation is of no less importance to the science of meteorology than that of solar radiation, but no perfect instrument has yet been contrived for its determination. Very valuable information, however, may be derived from the daily register of the minimum temperature of a register spirit-thermometer, the bulb of which is placed in the focus of a parabolic metallic mirror, turned towards the clear aspect of the sky, and screened from currents. The mirrors furnished to the observatories are of silver-plated copper, but planished tin-plate or zinc might be substituted without detriment. They are six inches diameter, and two inches deep, and the thermometers, which are graduated upon the stems, pass through sockets in their sides, in which they may be accurately adjusted by corks. Their bulbs do not exceed half an inch in diameter.

Even in the daytime, a thermometer so placed, and turned towards the clear sky, but away from the rays of the sun, will fall several degrees below the temperature of the surrounding air.

### 5. Hygrometers.

*Times of observation.*—Observations of the *dew-point* hygrometer are as desirable at the regular hours as those of the other meteorological instruments; but, as more difficulty attends the observation, it is more liable to omission, and it is of great importance, that when one experiment only can be made, the most advantageous hour should be selected for the purpose. Now, it is probable that the minimum temperature of the air in the twenty-four hours may correspond with the minimum temperature of the dew-point; and for the attainment of a mean result, the time of the highest dew-point should be selected, which would not differ much from 3 P.M., at which hour the observation should on no account be omitted. The hygrometer should also be observed, if possible, at 9 A.M. and 9 P.M., but the minimum temperature might probably be substituted for the 3 A.M. observation without any material error.

Occasional observations of the dew-point under peculiar circumstances, as for instance in the inhabited apartments of houses or between the decks of the ships when laid up in their winter quarters in the polar regions, could not but afford information of high practical importance.

All the ether of the dew-point hygrometer should be driven, by the warmth of the hand, from the covered ball into the uncovered, previously to an observation, and the ether should be dropped from a dropping-bottle very slowly upon the former. The temperature of the interior thermometer should be carefully noted upon the first appearance of the ring of dew upon the black bulb, and also its temperature upon its disappearance: the mean of the two observations, should they differ, may be entered as the dew-point, together with the temperature of the air by the exterior thermometer.

The *wet-bulb* hygrometer can be observed without difficulty, by mere inspection, and the observation should never be neglected at the regular hours. It is probable that the temperature of evaporation thus ascertained may afford the means of accurately determining the dew-point, and of solving all the points of hygrometry; but until all the necessary corrections shall have been agreed upon, one of the most essential requisites must be its frequent and accurate comparison with the dew-point, directly ascertained.

The hygrometers should be placed in the observatory, near to the standard thermometer, with which they should be frequently compared.

### 6. Vanes, Anemometers, and Rain Gauges.

The magnetic observatories and the Antarctic Expedition have been furnished with Osler's self-registering anemometer and rain-gauge.

In this instrument the direction of the wind is obtained by means of the vane attached to the rod, or rather tube, that carries it, and consequently causes the latter to move with itself. At the lower extremity of this tube is a small pinion working in a rack, which slides backwards and forwards, as the wind moves the vane; and to this rack a pencil is attached, which marks the direction of the wind on a paper ruled with the cardinal points, and so adjusted as to progress at the rate of 1 inch per hour, by means of a clock; the force is at the same time ascertained by a plate 1 foot square, placed at right angles to the vane, supported by two light bars running on friction rollers, and communicating with three spiral springs in such a way that the plate cannot be affected by the wind's pressure without instantly acting on the springs, and communicating the quantum of its action by a wire passing down the centre of the tube, to another pencil below, which thus registers its degree of force. The rain is registered at the same time by its weight acting on a balance, which moves in proportion to the quantity falling, and has also a pencil attached to it, recording the results. The receiver is so arranged as to discharge every half inch that falls, when the pencil again starts at zero.

It is probable that the results obtained with this instrument would require correction for the varying effects of the eddy, which must be formed behind the board, before they can be considered as exact measures of the pressure; and the effects of variations of temperature upon the force of the springs should be experimentally ascertained, particularly in very cold climates. This latter point may be determined by measuring the compression directly by the application of known weights.

Another self-registering anemometer has recently been constructed by Professor Whewell, which exhibits upon a diagram not only the direction and force, but the direction and integral effect of the wind, but which is more complex in its construction, and practically more liable to derangement.

In it a small set of windmill vanes, something like the ventilators of windows, are presented to the wind by a common vane, in whatever direction it may

blow. The current, as it passes, sets these vanes in rapid motion, and a train of wheels and pinions reduces the motion, which is thence communicated to a pencil traversing vertically, and pressing against an upright cylinder, which forms the support of the instrument: 1000 revolutions of the fly only cause the pencil to descend $\frac{1}{20}$th of an inch. The surface of the cylinder is covered with white paper, and the pencil, as the vane wavers, keeps tracing a thick irregular line, like the shadings on the coast of a map. The middle of the line may be easily traced, and it gives the mean direction of the wind, while the length of the line is proportional to the velocity of the wind, and the length of time during which it blows in each direction.

Those who do not possess a register-anemometer may make use of the common vane and Lind's wind-gauge. The position of the former should be clear of all deflections and eddies from objects of the same or a higher level, and of course its position with regard to the true north should be clearly determined. In registering the direction of the wind, it may be sufficient to use only 16 points of the compass.

Lind's wind-gauge for measuring the force or momentum of the wind is adjusted for use by filling it with water till the liquid in both legs of the siphon corresponds with 0° of the scale. It is to be held perpendicularly, with the mouth of the kneed tube turned towards the wind, and the amount of the depression in one leg, and that of its elevation in the other are to be carefully noted. The sum of the two is the height of a column of water which the wind is capable of sustaining at the time, and every body that is opposed to that wind will be pressed upon by a force equivalent to the weight of a column of water, having its base equal to the surface that is opposed, and its height equal to the altitude of the column of water sustained by the wind in the wind-gauge.

The height of this column being given, the force of the wind on a foot square is easily found by a table in the Appendix—(see *post*, p. 636.)

The observation of the gauge should always be made at the same point of a free space, and in gusty weather the maximum of the oscillation recorded. The most proper periods will be those of the other regular observations, but in great storms, or under other particular circumstances, occasional observations should be made, and registered apart.

Even in observatories which are provided with Osler's apparatus it is desirable that an accurate comparison should be made of the two anemometers.

The points most important to remark respecting the wind are,

1st. Its average intensity and general direction during the several portions of the day devoted to observation.

2ndly. The hours of the day or night when it commences to blow from a calm, or subsides into one from a breeze.

3rdly. The hours at which any remarkable changes of its direction take place.

4thly. The course which it takes in veering, and the quarter in which it ultimately settles.

5thly. The usual course of *periodical winds*, or such as remarkably prevail during certain seasons, with the law of their diurnal progress, both as to direction and intensity; at what hours, and by what degrees they commence, attain their maximum, and subside; and through what points of the compass they run in so doing.

6thly. The existence of crossing currents at different heights in the atmosphere, as indicated by the courses of the clouds in different strata.

7thly. The times of setting-in of remarkably hot or cold winds, the quarters from which they come, and their courses, as connected with the progressive changes in their temperature.

8thly. The connection of rainy, cloudy or fair weather, with the quarter from which the wind blows, or has blown for some time previously.

The rain-gauge may be of very simple construction. A cubical box of strong tin or zinc, exactly 10 inches by the side, open above, receives at an inch below its edge a funnel, sloping to a small hole in the centre. On one of the lateral edges of the box, close to the top of the cavity, is soldered a short pipe, in which a cork is fitted. The whole should be well painted. The water which enters this gauge is poured through the short tube into a cylindrical glass vessel, graduated to cubic inches and fifths of cubic inches. Hence 1 inch depth of rain in the gauge will be measured by 100 inches of the graduated vessel, and $\frac{1}{1000}$th inch of rain may be very easily read off.

It is very much to be desired that, being of such easy construction, more than one of these gauges should be erected, or at least one placed with its edge nearly level with the ground, and another upon the top of the highest building, rock, or tree, in the immediate vicinity of the place of observation, the height of which must be carefully determined; it having been satisfactorily ascertained that the height of the gauge above the ground is a very material element in the quantity of rain which enters it. The quantity of water should be daily measured and registered at 9 A.M.

### 7. Clouds and Meteors.

Many very highly interesting observations may be made, without the aid of instruments, upon the clouds. In describing them, Mr. Howard's nomenclature may be adopted with great advantage. By means of the clouds different simultaneous currents of wind may often be detected, the different directions of which should be carefully ascertained by referring their motions to some fixed object. Their gradual evaporation or precipitation should also be carefully noted, and particularly their regular disappearance at night, or their more irregular and sudden formation.

Rainbows, parhelia, halos, &c., will of course be noted amongst the occasional remarks of the register; and an attempt should be made to express approximatively by numbers, the proportion which the overcast portion of the sky may bear to the clear space. For this the hemisphere may be supposed to be divided into eight sections, and the cloudy portion may be expressed by the fraction $\frac{1}{8}$th or $\frac{3}{8}$ths, &c.

### 8. Electrometers.

The Council are fully impressed with the high importance of regular observations on the electrical state of the atmosphere; but they are not prepared to suggest any means of effecting this desirable object, which will at all correspond with the present advanced state of electrical physics. At no distant period they hope to supply a defect which is certainly a reproach to science. In the mean time much valuable information might be acquired by observations of an electroscope, on one of the ordinary constructions connected with a lofty insulated wire.

In erecting such a wire proper precautions should be taken against accidents by preparing a sufficient conductor in its immediate vicinity, by which a communication could be at once opened with the ground in case of any sudden and dangerous accumulation of the electric fluid.

As a temporary contrivance, a common jointed fishing rod, having a glass stick well varnished with shell lac substituted for its smallest joint, may be projected into the atmosphere. To the end of the glass must be fixed a metallic wire terminating in a point, and connected with an electroscope by means of a fine copper wire. If the wire be made to terminate in a spiral wrapped round a piece of cotton dipped in spirits of wine and inflamed, its power of collecting electricity will be sometimes doubled, but great precautions are necessary when this mode is employed. When the electroscope has been charged, the nature of the electricity may be tested in the usual way by excited glass or sealing wax.

The principal electroscopes which are capable of being employed to ascertain the electrical state of the atmosphere, or rather to compare its state at any given elevation with the state of the medium in contact with the instrument, are the following:

1. De Saussure's electrometer, which consists of two fine wires, each terminated by a small pith ball, and adapted to a small metal rod fixed in the upper part of a square glass cover, upon one of the faces of which a divided scale is marked, in order to measure the angles of deviation of the two balls.

2. Volta's electrometer, formed of two straws about 2 inches long and $\frac{1}{4}$th of a line broad, suspended from two very small moveable rings adapted to a metal rod; to measure the deviation of the straws a telescope with a nonius is employed.

3. Singer's electrometer, consisting of two slips of gold leaf suspended from the rod.

4. Bohnenberger's electroscope, formed of a single strip of gold leaf suspended from the conducting rod between two dry piles, the negative pole of one and the positive pole of the other being uppermost; this arrangement has the advantage of indicating the kind of electricity communicated to the conductor.

The observations made with these and similar instruments, have demonstrated that in serene weather the electricity of the atmosphere is always positive with regard to that of the earth, and that it becomes more and more positive in proportion to its elevation above the earth's surface, so that if an observer be on a mountain or in a balloon, if his conductor be directed downwards to reach an inferior stratum of air, his electroscope will indicate negative electricity; and if it be sent upwards into a superior stratum, positive electricity will be manifested. Various means have been resorted to in these experiments, such as connecting one of the extremities of the conducting wire to a kite, a small balloon, or the head of an arrow, the other extremity remaining attached to the electroscope.

It has been ascertained by the observations of De Saussure, Schubler, Arago, and others, that the positive electricity of the atmosphere is subject to diurnal variations of intensity, there being two maxima and two minima during the twenty-four hours. The first minimum takes place a little before the rising of the sun; as it rises, the intensity, at first gradually and then rapidly, increases, and arrives at its first maximum a few hours after. This excess diminishes at first rapidly and afterwards slowly, and arrives at its minimum some hours before sunset; it re-ascends when the sun approaches the horizon, and attains its second maximum a few hours after, then diminishes till sunrise, and proceeds in the order already indicated. The intensity of the free electricity of the atmosphere has also been found to undergo annual changes, increasing from the month of July to the month of November inclusive, so that the greatest intensity occurs in winter, and the least in summer.

In cloudy weather the free electricity of the atmosphere is still positive. During storms, or when it rains or snows, the electricity is sometimes positive and sometimes negative, and its intensity is always much more considerable than in serene weather. The electroscope will, during the continuance of a storm, frequently indicate several changes, from positive to negative.

The above is a short summary of almost all that is known respecting the laws of atmospheric electricity. It will be highly important to obtain a series of observations equal in accuracy to those made by Schubler at Frankfort in 1811 and 1812, simultaneously with the observations of the hygrometer, barometer, thermometer, &c. Combined observations at a number of different stations cannot fail to give us important information respecting the distribution of the free electricity in the atmosphere, and the extent and nature of the disturbances to which it is subject; but to render the results valuable it will be necessary to have instruments comparable with each other, and this may be a difficult matter to effect.*

Very recently a new method of investigating the electric state of the atmosphere has been proposed, likely to lead hereafter to very certain and valuable results; but it has not been sufficiently put in practice to enable the Council to recommend, at the present moment, the best form of instrument for making simultaneous and comparable observations, or the proper precautions to guide the observer in manipulating it.

For the principle of this instrument we are indebted to Mr. Colladon, of Geneva. He found that if the two ends of the wire of a galvanic multiplier, consisting of very numerous coils well insulated from each other, were brought in contact, one with a body positively, and the other with a body negatively charged, a current of electricity passes through the wire, until equilibrium is restored; the energy and direction of this current is indicated by the deviation of the needle from the zero-point of the scale. This instrument is applied to the purpose of ascertaining and measuring the atmospheric electricity, by communicating one end of the wire with the earth, and

* For a fuller account of what is known respecting atmospheric electricity, and the mode of conducting the observations, see Becquerel's *Traité de l'Electricité*, t. iv. pp. 78—125.

allowing the other to extend into the region of the atmosphere the electrical state of which is intended to be compared.

Thunder storms, of course, should be attended to; but it is of consequence also to notice distant lightning not accompanied with thunder audible at the place of observation, especially if it take place many days in succession, and to note the quarter of the horizon where it appears, and the extent which it embraces. In an actual thunder storm, especial notice should be taken of the quantity of rain which falls, and of the fits or intermittences of its fall, as corresponding, or not, to great bursts of lightning, as also of the direction of the wind, and the apparent progress of the storm with or against it.†

9. Registers.

The Register proposed by the Council may be comprised in two skeleton forms, which have been supplied to the magnetical observatories and to the expedition.

They are each calculated for one month's observation. *The first form* is for the insertion of observations as they are made in their uncorrected state. It consists of 12 principal divisions, and is ruled across for 31 days, and for the arithmetical convenience of casting up the sums and means of the quantities inserted. At the bottom of the sheet there is also a space provided for the hourly observations of the barometer and thermometers *on the twenty-first day of the month*, which will be more particularly described after the explanation of the principal divisions.

The outside compartments, both on the left and right of the sheet, are for the date of the month and the phases of the moon.

The second compartment is for the height of the barometer, and the temperature of the mercury for the four regular periods of observation.

The third compartment is appropriated to the dew-point hygrometer, and contains also four columns for the four daily observations, each of which is subdivided into three, for the temperature of the air, the dew-point, and the difference between the two.

The fourth compartment is for the wet-bulb hygrometer, and is similarly divided and subdivided for the temperature of the dry-and-wet bulb thermometer, and for their differences.

The fifth compartment is prepared for the maxima and minima of temperature, and is divided into three. In the first division are to be recorded the maxima and minima of thermometers carefully placed in the shade and screened from radiation. In the second the maxima of a blackened thermometer exposed to the sun, and the minima of a thermometer placed in a metallic mirror, and radiating freely to the clear sky. The third is devoted to occasional observations of the actinometer under favourable circumstances.

The sixth compartment is for the temperature of the surface-water of the sea, or of any river in the immediate neighbourhood of the observatory.

The seventh compartment is prepared for observations upon the direction and force of the wind at the four regular hours of registry. In the left-hand column of each division is to be recorded the direction of the vane, and in the right-hand column the height of Lind's gauge, in tenths of an inch of water.

In the eighth compartment the amount of rain is to be registered once in the day; and in the ninth the electrical state of the atmosphere, if possible, at the four periods, 3 A.M., 9 A.M., 3 P.M., and 9 P.M.

The tenth compartment is appropriated to remarks on the clouds, and weather generally; and in the eleventh is to be noted, at noon, the longitude and latitude at sea.

On a careful review of the month's observations, the maxima and minima results should have the algebraic signs + and − respectively affixed.

*The second form* is devoted to the corrected results of the observations, and to the optical comparison together of some of them, by their projection upon a scale of equal parts.

The upper half of the sheet is vertically divided into two equal parts, each prepared for half the month's observations, and accordingly ruled across into sixteen spaces for the daily observations, and two for the sums and means of the quantities. Each half is also divided into five compartments.

† On these subjects the Council especially recommend the attentive perusal of Arago's 'Notice sur le Tonnerre.'

The first is for the date of the month and the phases of the moon.

The second for the corrected height of the barometer at 32° Fahr.

The third is appropriated to the elastic force of the aqueous vapour corresponding to the dew-point, and which may be taken from the Table in the Appendix.

The fourth is for the maximum and minimum of temperature, and the mean of the two.

And the fifth for occasional remarks.

The lower half of the sheet is also vertically divided into two equal parts, each of which is similarly divided into 31 columns for the daily observations of a month; and these again subdivided into four, for the six-hourly observations of each day. The vertical lines thus formed are divided into 6 inches; and each inch into tenths of an inch, and half-tenths, by horizontal lines.

The left-hand compartment thus ruled, is intended for the projection of curves of temperature; for this purpose each tenth of an inch upon the scale must be reckoned a degree, which will be divided by the faint line into halves.

The value of the degree may be arbitrarily fixed, and inserted in the margin according to convenience. Towards the upper part of the scale the results of the six-hourly observations should each be marked by a dot in its appropriate space, and the dots may be afterwards connected by a line.

The temperatures of the dew point, or of the wet-bulb thermometer, or the mean temperature, may be compared with this primary result by projecting their curves in a similar way beneath it; and should the observations of these points be less frequent than four times in the day, the daily spaces may easily be divided accordingly.

The right hand compartment is appropriated to the projection of curves of pressure, and the four daily observations of the barometer are to be marked by dots towards the upper part of the scale of inches, and afterwards connected by a line. Towards the lower part of the scale the elastic force of the vapour is to be noted, and the marks to be similarly connected by a line.

On either the scale of temperature or of pressure, occasional comparisons may be made with results obtained at other stations, which, if judiciously selected, cannot fail to prove of high interest and importance. They should, however, be laid down in pencil, or marked by a fainter line.

At the bottom of the first skeleton form will be found a space prepared for the 24 hourly observations of the *twenty-first day* of the month, both in their uncorrected and their corrected state. It is divided into four compartments for 6 hours each. The instruments which can with most facility be observed in this manner, are the barometer with its attached thermometer, and the dry and wet-bulb thermometers; and columns are appropriated to each of these. It is desirable that the means of each 6 hours should be calculated, and spaces have been provided accordingly for the arithmetical operations.

In casting up the sums and calculating the *means*, care should be taken in all cases to verify the results by repetition; and the Council recommend in every instance, before adding up the columns, to look down each to see that no obvious error of entry (as of an inch in the barometer, a very common error) may remain to vitiate the mean result. The precaution should also be taken of counting the days in each column, so as to make no mistake in the divisor.

The skeleton forms will be interleaved with blank pages, to facilitate computations and comparisons, and to afford space for other observations of atmospheric phenomena, which will perpetually present themselves to those who make it their business or their pleasure to watch the changes of the weather on a judicious plan. The Council, indeed, wish it to be understood that, in the suggestions which they have offered, they have taken into consideration only such observations as are indispensable for laying the first foundations of meteorological science; some investigations of a more refined character they may, probably, make the subject of a future report.

As soon as the register of a month's observations has been computed it should be copied, and the copy carefully compared with the original by two persons, one reading aloud from the original, and the other attending to the copy, and then exchanging parts,—a process always advisable whenever great masses of figures are required to be correctly copied.

A copy so verified should be transmitted regularly to such person or public body as, under the circumstances, may be authorized or best adapted to receive and discuss the observations.

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The Appendix contains some valuable papers and tables, the use of which is, however, comparatively limited. Those of most general interest are the following:—

Correction to be added to Barometers for Capillary Action.

| Diameter of Tube. | Correction for | |
|---|---|---|
| | Unboiled Tubes. | Boiled Tubes. |
| Inch. | Inch. | Inch. |
| 0·60 | 0·004 | 0·002 |
| 0·50 | 0·007 | 0·003 |
| 0·45 | 0·010 | 0·005 |
| 0·40 | 0·014 | 0·007 |
| 0·35 | 0·020 | 0·010 |
| 0·30 | 0·028 | 0·014 |
| 0·25 | 0·040 | 0·020 |
| 0·20 | 0·060 | 0·029 |
| 0·15 | 0·088 | 0·044 |
| 0·10 | 0·142 | 0·070 |

Table showing the force of the Wind on a square foot for different heights of the Column of Water in Lind's Wind-guage.

| Height of the Column of Water. | Force of the Wind in Avoirdupoise Pounds. | Common designation of such a wind. |
|---|---|---|
| Inches. | | |
| 12 | 62·5 | |
| 11 | 57·29 | |
| 10 | 52·08 | Most violent hurricane. |
| 9 | 46·87 | |
| 8 | 44·66 | A very great hurricane. |
| 7 | 36·55 | A great hurricane. |
| 6 | 31·75 | A hurricane. |
| 5 | 26·04 | A very great storm. |
| 4 | 20·83 | A great storm. |
| 3 | 15·62 | A storm. |
| 2 | 10·42 | A very high wind. |
| 1 | 5·21 | A high wind. |
| 0·5 | 2·60 | A brisk gale. |
| 0·1 | 0·52 | A fresh breeze. |
| 0·05 | 0·26 | A pleasant wind. |

In great degrees of cold, a saturated solution of sea salt may be used instead of water, the specific gravity of which is 1·244. If the force in the above Table for any height be multiplied by the specific gravity, the product will be the true force, as measured by the solution.

Elastic Force of Aqueous Vapour for every degree of temperature, from 0° to 103° Fahr.

| Temp. Fahr. | Force. Inches of Mercury. | Temp. Fahr. | Force. Inches of Mercury. | Temp. Fahr. | Force. Inches of Mercury. | Temp. Fahr. | Force. Inches of Mercury. |
|---|---|---|---|---|---|---|---|
| 0° | 0·051 | 26° | 0·147 | 52° | 0·389 | 78° | 0·942 |
| 1 | 0·053 | 27 | 0·153 | 53 | 0·402 | 79 | 0·973 |
| 2 | 0·056 | 28 | 0·159 | 54 | 0·417 | 80 | 1·005 |
| 3 | 0·058 | 29 | 0·165 | 55 | 0·432 | 81 | 1·036 |
| 4 | 0·060 | 30 | 0·172 | 56 | 0·447 | 82 | 1·072 |
| 5 | 0·063 | 31 | 0·179 | 57 | 0·463 | 83 | 1·106 |
| 6 | 0·066 | 32 | 0·186 | 58 | 0·480 | 84 | 1·142 |
| 7 | 0·069 | 33 | 0·193 | 59 | 0·497 | 85 | 1·179 |
| 8 | 0·071 | 34 | 0·200 | 60 | 0·514 | 86 | 1·217 |
| 9 | 0·074 | 35 | 0·208 | 61 | 0·532 | 87 | 1·256 |
| 10 | 0·078 | 36 | 0·216 | 62 | 0·551 | 88 | 1·296 |
| 11 | 0·081 | 37 | 0·224 | 63 | 0·570 | 89 | 1·337 |
| 12 | 0·084 | 38 | 0·233 | 64 | 0·590 | 90 | 1·380 |
| 13 | 0·088 | 39 | 0·242 | 65 | 0·611 | 91 | 1·423 |
| 14 | 0·092 | 40 | 0·251 | 66 | 0·632 | 92 | 1·468 |
| 15 | 0·095 | 41 | 0·260 | 67 | 0·654 | 93 | 1·514 |
| 16 | 0·099 | 42 | 0·270 | 68 | 0·676 | 94 | 1·562 |
| 17 | 0·103 | 43 | 0·280 | 69 | 0·699 | 95 | 1·610 |
| 18 | 0·107 | 44 | 0·291 | 70 | 0·723 | 96 | 1·660 |
| 19 | 0·112 | 45 | 0·302 | 71 | 0·748 | 97 | 1·712 |
| 20 | 0·116 | 46 | 0·313 | 72 | 0·773 | 98 | 1·764 |
| 21 | 0·121 | 47 | 0·324 | 73 | 0·799 | 99 | 1·819 |
| 22 | 0·126 | 48 | 0·336 | 74 | 0·826 | 100 | 1·874 |
| 23 | 0·131 | 49 | 0·349 | 75 | 0·854 | 101 | 1·931 |
| 24 | 0·136 | 50 | 0·361 | 76 | 0·882 | 102 | 1·990 |
| 25 | 0·142 | 51 | 0·375 | 77 | 0·911 | 103 | 2·050 |

## PRINCIPLE OF THE DAGUERROTYPE.

Paris, August 21st.

I write to you to report,—though of necessity hastily,—the proceedings of the *Académie des Sciences* of Monday last, when M. Arago, in the presence of a crowded audience, which had besieged the doors of the Institute three hours before the commencement of the sitting, divulged the secret of M. Daguerre's invention, which has now, as you are aware, become public property. Three drawings

having been exhibited, by way of specimens, M. Arago began by recapitulating the discoveries,—or rather hints towards discoveries,—of former chemists: he afterwards dwelt upon the progressive experiments of M. Niepce, since carried out by M. Daguerre. As, however, your columns already contain notices of these, I will come at once to the publication of the secret of the perfect invention, and in order to give you this as fully and clearly as possible, I send you an abstract from the report published in yesterday's *Journal des Débats*.

M. Arago stated that, according to M. Daguerre's process, copper plated with silver is washed with a solution of nitric acid, for the purpose of cleansing its surface, and especially to remove the minute traces of copper, which the layer of silver may contain. This washing must be done with the greatest care, attention, and regularity. M. Daguerre has observed, that better results are obtained from copper plated with silver, than from pure silver; whence it may be surmised, that electricity may be concerned in the action.

After this preliminary preparation, the metallic plate is exposed, in a well-closed box, to the action of the vapour of iodine, with certain precautions. A small quantity of iodine is placed at the bottom of the box, with a thin gauze between it and the plate, as it were, to sift the vapour, and to diffuse it equally. It is also necessary to surround the plate with a small metallic frame, to prevent the vapour of iodine from condensing in larger quantities round the margin than in the centre; the whole success of the operation depending on the perfect uniformity of the layer of ioduret of silver thus formed. The exact time to withdraw the sheet of plated copper from the vapour, is indicated by the plate assuming a yellow colour. M. Dumas, who has endeavoured to ascertain the thickness of this deposit, states that it cannot be more than the millionth part of a *millimètre*. The plate thus prepared, is placed in the dark chamber of the camera obscura, and preserved with great care from the faintest action of light. It is, in fact, so sensitive, that exposure for a tenth of a second is more than sufficient to make an impression on it.

At the bottom of the dark chamber, which M. Daguerre has reduced to small dimensions, is a plate of ground glass, which advances or recedes until the image of the object to be represented is perfectly clear and distinct. When this is gained, the prepared plate is substituted for the ground glass, and receives the impression of the object. The effect is produced in a very short time. When the metallic plate is withdrawn, the impression is hardly to be seen, the action of a second vapour being necessary to bring it out distinctly: the vapour of mercury is employed for this purpose. It is remarkable, that the metallic plate, to be properly acted upon by the mercurial vapour, must be placed at a certain angle. To this end, it is enclosed in a third box, at the bottom of which is placed a small dish filled with mercury. If the picture is to be viewed in a vertical position, as is usually the case with engravings, it must receive the vapour of mercury at an angle of about 45°. If, on the contrary, it is to be viewed at that angle, the plate must be arranged in the box in a horizontal position. The volatilization of the mercury must be assisted by a temperature of 60° (of Reaumur).

After these three operations, for the completion of the process, the plate must be plunged into a solution of hypo-sulphite of soda. This solution acts most strongly on the parts which have been uninfluenced by light; the reverse of the mercurial vapour, which attacks exclusively that portion which has been acted on by the rays of light. From this it might perhaps be imagined, that the lights are formed by the amalgamation of the silver with mercury, and the shadows by the sulphuret of silver formed by the hypo-sulphite. M. Arago, however, formally declared the positive inability of the combined wisdom of physical, chemical, and optical science, to offer any theory of these delicate and complicated operations, which might be even tolerably rational and satisfactory.

The picture now produced is washed in distilled water, to give it that stability which is necessary to its bearing exposure to light without undergoing any further change.

After his statement of the details of M. Daguerre's discovery, M. Arago proceeded to speculate upon the improvements of which this beautiful application of optics was capable. He adverted to M. Daguerre's hopes of discovering some further method of fixing not merely the images of things, but also of their colours: a hope based upon the fact, that, in the experiments which have been made with the solar spectrum, blue colour has been seen to result from blue rays, orange colour from orange, and so on with the others. Sir John Herschel is sure that the red ray alone is without action. The question arose, too, whether it will be possible to take portraits by this method? M. Arago was disposed to answer in the affirmative. A serious difficulty, however, presented itself:—entire absence of motion on the part of the object is essential to the success of the operation, and this is impossible to be obtained from any face exposed to the influence of so intense a light. M. Daguerre, however, believes that the interposition of a blue glass would in no way interfere with the action of the light on the prepared plate, while it would protect the sitter sufficiently from the action of the light. The head could be easily fixed by means of supporting apparatus. Another more important desideratum is, the means of rendering the picture unalterable by friction. The substance of the pictures executed by the Daguerrotype is, in fact, so little solid—is so slightly deposited on the surface of the metallic plate, that the least friction destroys it, like a drawing in chalk: at present, it is necessary to cover it with glass.

From his numerous experiments on the action of light on different substances, M. Daguerre has drawn the conclusion that the sun is not equally powerful at all times of the day, even at those instants when his height is the same above the horizon. Thus, more satisfactory results are obtained at six in the morning than at six in the afternoon. From this, too, it is evident, that the Daguerrotype is an instrument of exquisite sensibility for measuring the different intensities of light, a subject which has hitherto been one of the most difficult problems in Natural Philosophy. It is easy enough to measure the difference in intensity between two lights viewed simultaneously, but when it is desired to compare daylight with a light produced in the night—that of the sun with that of the moon, for example—the results obtained have had no precision. The preparation of M. Daguerre is influenced even by the light of the moon, to which all the preparations hitherto tried were insensible, even when the rays were concentrated by a powerful lens.

In physics, M. Arago indicated some of the more immediate applications of the Daguerrotype, independently of those which he had already mentioned in Photometry. He instanced some of the most complex phenomena exhibited by the solar spectrum. We know, for example, that the different coloured rays are separated by black tranversal lines, indicating the absence of these rays at certain parts; and the question arises whether there are also similar interruptions in the continuity of the chemical rays? M. Arago proposes as a simple solution of this question, to expose one of M. Daguerre's prepared plates to the action of a spectrum; an experiment which would prove whether the action of these rays is continuous or interrupted by blank spaces.

I shall only add, that M. Daguerre has entered into a contract with Giroux, the celebrated toyman, for the practical application of his discovery—and that it is said he has already *in petto*, some new results of importance, which he will submit to the *Académie* at an early opportunity.

## FOREIGN CORRESPONDENCE.

**Orsova, on the Danube, borders of Hungary, July 20.**

As we have just heard of the death of the Sultan, I shall take the opportunity of passing my quarantine here, to say something respecting him. Mahmoud, as every one knows, succeeded to the throne on the fall of his brother Selim. He had then to choose between the old system of permitting the oligarchy or aristocracy (if it may be called either) of the Janizzaries to advance in power; or the new one, of destroying the influence of this powerful body. He preferred the latter, unappalled by the fate of his brother. It was perhaps necessary for his own liberty, and that of his people: no despotism can equal that of an ignorant prætorian band, whose existence was sanctified by the religion of the country. In Turkey, to destroy men is considered the readiest way of getting rid of their *inconvenient* opinions. When the new corps of artillery, Topgees, were therefore considered sufficiently disciplined, the blow was struck, and 30,000 Janizzaries—the barbarian and plebeian (if I may be pardoned the expression,) nobility to the Osmanlies—perished, shot down in masses, slaughtered in detail, or drowned in the Bosphorus. The remainder fled from the capital, or obliterated from their arms the marks of their order, once so proudly displayed.

In all this, Mahmoud acted by the advice of one staunch, determined man—his fears and his ambition alike drove him on to the deed. But when it was done he had made enemies of the most powerful families, all over his empire—he had ruined, as well as massacred, thousands, and for ever quenched the flame of that wild chivalry, which had burnt since the Moslem army crossed the Hellespont, and established itself in its first European conquest at Gallipoli. Having been forced by circumstances thus far, it was evident to the Sultan's advisers, that a naval and military force must be framed on the European plan;—hence has arisen the host of European *instructors*, mechanics, artisans, engineers, and shipbuilders, which has ever since engaged the intriguers of Stamboul in schemes for procuring money or favour. Each charlatan in his turn obtained the ear of some great man, and his scheme was tried, upon the same principle as nurse-maids bring forth the different games or toys, which may please young miss or master. When the toy was out of favour, or broken by unskilful use, or the nurses turned away, the subject was at once forgotten.

Years of experience have somewhat ameliorated this system, as superior Europeans have been obtained, a greater necessity pressed, or a stronger belief prevailed, as to the efficacy of Frank means of power. But, at this time, no regiment or ship is commanded by a Frank, not a dozen Turks speak any Frank language, nor have half so many any knowledge of the principles of power in European states. In all this, therefore, the late Sultan was always an ignorant Turk. For selfish objects he had destroyed one system of power, but he had not the greatness of mind to support another *efficiently*. His armies, whether towards the east, west, or south, melted away before their opponents; and in vain did his fleets oppose even the armed trading vessels of the Greeks. On three sides his empire was dismembered, and on none were his Pachas *faithful*. He himself had set them notable examples of treachery in the cases of Hussein Pacha, Ali Pacha, and a hundred others. He condescended even to order or sanction murder. 60,000 Sciotes were butchered or enslaved;* half as many Constantinopolitan Greeks perished in the capital; none of these had rebelled—nay, an insurrectionary force, landed at Scio, had been opposed, and the chiefs of the island gave themselves up voluntarily as hostages. The Rayah subjects of the Porte were thus irreparably outraged, as the principal Moslems had been estranged before from the government. Humanity out of the question, such policy is surely not that of a great or enlightened man. Thus have failed the Sultan's attempts at augmenting his power. Now let it be asked, what has he done, meanwhile, for the *good* of his people? He has established military *hospitals* and schools in the army, and a school for surgery and medicine. The former are confined to Constantinople, the latter to the guards; and in the last are 150 children and boys, under sixteen, learning French, as preparatory to their medical studies. A fine building has been erected; but not a single subject has yet been dissected.

Neither trade, nor agriculture, nor commerce, has been fostered by one act (except the treaty with England and Austria last year, not yet carried into effect). The horrible injustice of all the governments of the empire, and the unbounded oppression exercised over the working classes, have not decreased; and the best proof of this is, that agriculture has not advanced in the empire; that its population and fixed capital in buildings, &c. have positively diminished. No returns are made of population;

* The custom-house books of Scio, as I was informed by a consul living there at the time, proved that 30,000 captives were exported during and after the massacre.

but where endless tracts of land remain desert in every part of the empire, and a great part of every town is invariably in ruins, we may fairly conclude that the population has decreased during the reign of Mahmoud. But it may be said, that Mahmoud, though he failed in his attempts at power, and never *did* attempt to increase the strength of his empire by making his people happier, was individually enlightened. He has been called intellectual, because he understood Arabic, and could write a few rhymes in Persian: probably, if he had read all the poetry in both, he would not have been a better sovereign. But this trifling accomplishment, if he possessed it, was as useless to him as the drinking of champagne, the wearing the Nizam dress, and the clipping of his beard. His chief liberality from prejudice has been shown, by having his own picture painted, and by removing the tomb of a holy dervish—both abominations to true believers.

Not long since I visited the Summer and the New Palace of the Sultan—huge wooden buildings on the Bosphorus; they contained no indications of good taste:—gardens laid out in the stiff Italian style, but without the Italian magnificence of space;—rooms painted in the French style, but without French elegance: huge defective looking-glasses, and uncomfortable sofas and chairs (for the Sultan's especial use), singing birds of jewels, musical boxes, and ornamental clocks, do not bespeak the intellectual powers of the owner of these houses, where all that is not Turkish were as well away. In the new palace, to be sure, there is a marble colonnade, a marble room, and some well-constructed baths. The female apartments are large, but plain: the autocrat's gallantry does not give the ladies *fine* apartments, though they certainly form his chief source of amusement, and the most acceptable gift which his relatives or courtiers can make him, on state occasions. In the New Palace is, however, a noble hall, the ill-proportioned columns of which are festooned with gilt wreaths; and this is to be a reception room for the Feast of the Ramadan, and other great occasions. It is the *capo d'opera* of the architect; and very consolatory it is to think, that the great Sultan can approach no nearer to what is admirable, notwithstanding his absolute power over the lives and property of his subjects. The other day the Sultan fancied he would have a steam-boat for passengers: his mode of doing it was, to order the bankers to *provide* one. She was foreign built, with foreign engines, and commanded by foreigners, and was lost the second voyage. He also ordered a steam-yacht for himself; the beautiful vessel floats in the Golden Horn; but so little honour does she do to Turkey, that she was fitted up by Germans, provided with engines of English make, built by an American, and commanded by a Scotchman. The Sultan was, however, gratified with this vessel, as he was with the last Georgian, or newest French clock. Many will fancy that the death of the great Moslem autocrat will make a great change. It seems to me it will not: the young prince may get into the hands of other pachas than those who have last ruled—may change his favourites oftener; but his system will be the same;—to struggle after power by means which will not obtain it; to follow this or that plan, as serves the purpose of those in favour; but neither he nor his favourites will seek the good of their country, because they have not the wish, or the knowledge necessary to obtain it. The principles of barbaric despotism fail them, and they are incapable of acting on others. They can never get the empire to act unitedly, *however great the object*; for however much a Turk may hate a Russian, dislike an Englishman, disdain a Frenchman, or despise a Persian, he does not, and he cannot, trust a Turk.

## OUR WEEKLY GOSSIP.

We have not lately referred to the meeting of the British Association, from a feeling that it might, even at the last hour, be put off. The last hour, however, has arrived. Birmingham remains perfectly quiet, and we hope on Monday to find there a strong muster of the more distinguished members. Members, on their arrival, must apply at King Edward's School, New Street, where their tickets will be exchanged, and every information given in regard to lodgings, ordinaries, and other arrangements.

The Sections will assemble on Monday, at 11 P.M., and afterwards at the same hour, on every day of the week (Saturday excepted), in the following places, which are marked on the members' tickets:—

Section
A.—*Mathematics and Physics.*—King Edward's School, New Street.
B.—*Chemistry and Mineralogy.*—Copper Company's Room, Cannon Street.
C.—*Geology and Physical Geography.*—Philosophical Institution, Cannon Street.
D.—*Zoology and Botany.*—Athenæum, Temple Street.
E.—*Medical Science.*—Medical School, Paradise Street.
F.—*Statistics.*—Billiard Room, adjoining the News Room.
G.—*Mechanical Science.*—Shakspeare Room, New Street.

The Sectional Committees will meet on Monday, at 10 A.M., and on every succeeding day of the week, at the same hour, in rooms adjacent to the Section rooms, for the transaction of the business specified in instructions delivered to the Secretaries of each Section.

The Model Room will be open during the whole week of the Meeting, from 8 A.M. to 5 P.M.

On Monday evening the first General Meeting of the Association will be held in the Town Hall, when the Rev. William Vernon Harcourt, F.R.S., and the President elect, will take the chair.—On Tuesday evening, the Town Hall will be opened for conversation.—The arrangements for Wednesday and Thursday evenings are left for the determination of the General Committee.—On Friday evening the Town Hall will be opened for conversation.—On Saturday evening the concluding General Meeting of the Association will take place, when the proceedings of the General Committee, and the grounds of the several grants of money sanctioned by them will be explained.—An excursion to Dudley is planned for Friday, for the purpose of allowing the non-resident Members of the Association an opportunity of visiting the Iron Works, the Sedgley Hills, the Rowley Hills, the Limestone Caverns, and other interesting objects. A special programme will be prepared of the intended route and plan of this excursion.—The Horticultural Exhibition will take place in the Botanic Garden, Edgbaston, on Wednesday, when the Members of the Association are invited to be present.

Breakfasts will be provided, daily, during the week, from 8 to 10 A.M., and dinners at 5 P.M., at the New Royal Hotel, New Street; the Acorn, Temple Street; the Union Inn, Union Street; and the White Horse, Congreve Street; except on Thursday, when a General Ordinary will be provided in the Town Hall at half-past five.

Besides the stir at the *Académie des Sciences*, reported by us elsewhere, the past week has been "illustrated" in Paris by the distribution of prizes, at the Sorbonne, by the Minister of Public Instruction, to the most distinguished students of the various colleges of the metropolis. This took place in the presence of the Royal Family and other distinguished personages,—the Dukes of Aumale and Montpensier being among those to whom prizes were awarded. Another, high on the scale of success, was M. Giraud, a young gentleman of colour from Martinico: and the successful candidates, after the examination, dined with Louis Philippe. M. Giraud's competitor, it may be noted, is a youth from the city of London. Surely a cosmopolitan spirit of benevolence and toleration must be on the increase, if we are to augur anything from a notice in the German papers of the opening of a new synagogue at Cassel on the 8th of this month, at which assisted the civil and military authorities of the town, the members of the diplomatic body, and the clergy of the different religious congregations.

To return to Paris for a moment—we believe that it is now fixed that the Italian Opera shall be still held at the *Odéon*, and not at the *Académie Royale*.—The first novelty at this latter theatre is announced by our contemporaries to be a French version of the '*Fidelio*;' after this Donnizetti's *Martyrs* (the suppressed 'Polyeucte' of San Carlos, at Naples); and last and best, a new work by Meyerbeer: we presume for the carnival of 1840.



## MUSIC AND THE DRAMA

Our notices of the doings at the HAYMARKET might almost be limited to announcements of the re-appearances of Messrs. Power and Macready, Mrs. Warner and Miss Helen Faucit, and the engagement of Miss Ellen Tree, on her return from America. 'Othello' and the 'Lady of Lyons' have been too often criticized to give occasion for remark, when the only difference between the representations of them here and at Covent Garden, is of a kind not calculated to elicit praise. Among the readers of the *Athenæum* are but few of that class who are interested in knowing how many degrees less exceptionable Mr. Phelps's *Iago* is than Mr. Cooper's; or are curious to note the difference in the personations of the two spiteful suitors of the 'Lady of Lyons,' by Messrs. Webster and Phelps, from those by Messrs. Elton and Meadows. Nor indeed—till instructed by the present management of the ENGLISH OPERA HOUSE—did we think that the theatrical quidnuncs, who, living in a green-room atmosphere, discuss an alteration in the cast of a popular play as if it were a matter of national concern, were so numerous as to make it worth while for a manager to cater for their particular tastes, by offering such questionable novelties as worthless Italian operas "adapted" to English words, but not adapted to the capacities of English vocalists. Surely it would tend more to the profit of managers, the reputation of actors, and the prosperity of the stage as an intellectual amusement, if, instead of wearying the public with endless repetitions of the same pieces, the excitement of novelty were added to stimulate public attention. Are there no presentable dramas or operas by Englishmen to be found, nor writers capable of producing either?—or do managers prefer eking out the attraction of popular performers, by baits held out to half-price seekers of broad fun? Mr. Webster's "bills" being indorsed by some good names, the Haymarket firm keeps up its credit, but the business might nevertheless be increased.

*Cerography.*—An account has appeared in the American papers of a new method of engraving, the nature of which appears to be unknown, though specimens have been published. The editor of the *Boston Daily Advertiser* says he has endeavoured, but without success, to form some conjecture as to the manner in which the work is executed.—"Being printed," he observes, "on a large sheet in common with the letter-press of a large newspaper, the plate must be of the character of a wood engraving, yet it possesses almost the delicacy of a copper-plate engraving, and abounds in lines which are evidently impracticable in wood engraving. The uniformity of the lettering, although varied by the diversity of characters afforded by the use of different fonts of type, shows that this part of the work is of the nature of stereotype casting, but in what manner the shading, roads, and other arbitrary lines are inserted, it is difficult, from an inspection of the impression, to imagine, unless it be by some process of etching. From what is stated by the inventor of the rapidity and cheapness of the execution, the size to which the plate may be extended, its adaptation to the rapid and cheap mode of printing, by which the ordinary book and newspaper printing is executed, we cannot but regard it as a very important and useful invention, particularly applicable to the printing of maps and drawings, in connexion with letter-press, for the illustration of works of almost every description." The *New York Observer* further states—"The advantages of Cerography are, 1. The engraving of many subjects can be executed with a rapidity approaching very near to that of drawing upon stone; and the whole expense of a plate prepared for the press will ordinarily be less than that of a plate in copper or wood. 2. The plate is durable under the press. A million good copies may be struck from it; and as it can be stereotyped, the number of plates may be multiplied indefinitely at a trifling expense,

and each plate will give a million copies. 3. Lines of all engravings, except, perhaps, the very finest class, can be made with nearly or quite the same perfection as in copper or steel, and with less labour. 4. We know of no limit to the size of cerographic plates. We suppose they may be made as large as the bed of the largest Napier press. 5. The printing is executed with the common printing press, and of course as rapidly as wood-cut or letter-press printing. With this statement, our readers can judge, as well as ourselves, of the effects which Cerography, in the hands of accomplished artists will probably produce on the other arts of engraving. We suppose that, with an improvement of which it is evidently susceptible, it will also have an important effect on the art of printing, especially on printing in the characters of the Chinese, Hindoo, and other Oriental languages. Even in its present state, it will, no doubt, be used as a substitute for type-setting in some cases; but of this we will say more hereafter."

### TO CORRESPONDENTS.

*Mr. Chatto and the Athenæum.*—Early in the week we received a long letter from Mr. Chatto. Had we desired only to triumph over him, we should certainly have complied with his request, and published it, as containing proofs of the insufficient grounds on which he had calumniated us. But our object could not be thus attained. We were satisfied from the first, that so far as our readers—so far as all to whom we were in the remotest degree known—were concerned, it was not necessary even to reply to so absurd a charge; and as to those who lent a willing and a greedy ear to it, or who wondered and gave it currency, they were hardly worthy of a reply; but Mr. Chatto was a man blinded by passion, who, honestly perhaps, believed in the fictions of his brain; and we were anxious, if possible, to disabuse his mind of so unjust a prejudice. Instead, therefore, of continuing a controversy to his manifest disadvantage,—for if the charges were true, he was at best but groping in the dark for proofs to establish them,—we proposed an interview, at which he should have leave to push his inquiries without restraint—to ask and have answered any and all the questions he pleased. The result, in justice to Mr. Chatto, we now submit to our readers:—

*To the Editor of the Athenæum.*

SIR,—As from the explanation which you have afforded me, I am thoroughly convinced that you were not knowingly a party to the attempt of Messrs. Jackson and Knight to conceal my actual share in the 'Treatise on Wood Engraving;' and that in the review of the work, you were induced by no corrupt motive to suppress my name, I hasten to retract the charge which I made against you in the Third Preface, and to express my regret that, having been deceived by appearances, I should have made it.

With respect to the report of your having received 100*l.* to review the work, I conceive it due no less to you than to myself to declare, that I never heard it, that I never propagated it, and that I do not believe it. Though I have heard it said, that probably Knight & Co. had defrayed the expense of the illustrated sheet of the *Athenæum*, No. 603, I never believed, and never propagated the report.

Permit me to observe, that I was not a party, as you charge me, to any deception practised either on you or on the public. Those who suppressed a portion of my original preface have to answer for this. In your remarks on the Third Preface, in the *Athenæum* of Saturday last, I perceive that, in one instance, you have, unintentionally I believe, misquoted me. I stated truly, that Mr. Jackson had "not even seen most of the original *old* woodcuts described, or noticed by me in the course of the work." In your quotation, the important qualification "*old*" is omitted.

I am, Sir, your obedient servant,
53, Pratt-street, Camden Town, WM. A. CHATTO.
20th August, 1839.

The word *old* was, as Mr. Chatto states, accidentally omitted in the passage referred to; but we cannot consider it an important qualification, with reference to our argument. Further, it must be distinctly understood, that though we have allowed Mr. Chatto to speak of the "attempt of Messrs. Jackson and Knight to conceal his share in the Treatise," because after the unavoidable mention of those gentlemen last week, it would have been mere affectation to have struck out their names, we do not mean in any, the slightest, degree, to countenance such a charge. So far, indeed, as Mr. Knight is concerned, it appears to us utterly absurd; and as to Mr. Jackson, we have everywhere heard him spoken of as a highly-respectable and honourable man; and our faith, as our readers may suppose, is not likely to be shaken by the assertions of Mr. Chatto, however confidently made. Of the facts we know nothing.

L.L.L.—A Recluse.—D.—J.B.—Meteorologicus—received. No such letter as mentioned by D. D. has reached us. We are obliged by the copy of the Jersey paper.



## BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

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